5701A/5700A

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Ballantine

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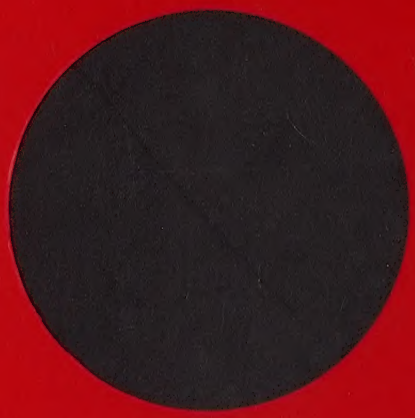


Ballantine

5700A
5701A

AUTOCONVERT

FREQUENCY COUNTERS

SERIAL NUMBER PREFIX – 051

BALLANTINE LABORATORIES, INC.

P.O. BOX 97
BOONTON, NEW JERSEY 07005 USA
201-335-0900/TWX: 710-987-8380

90100181A

NOVEMBER 1972

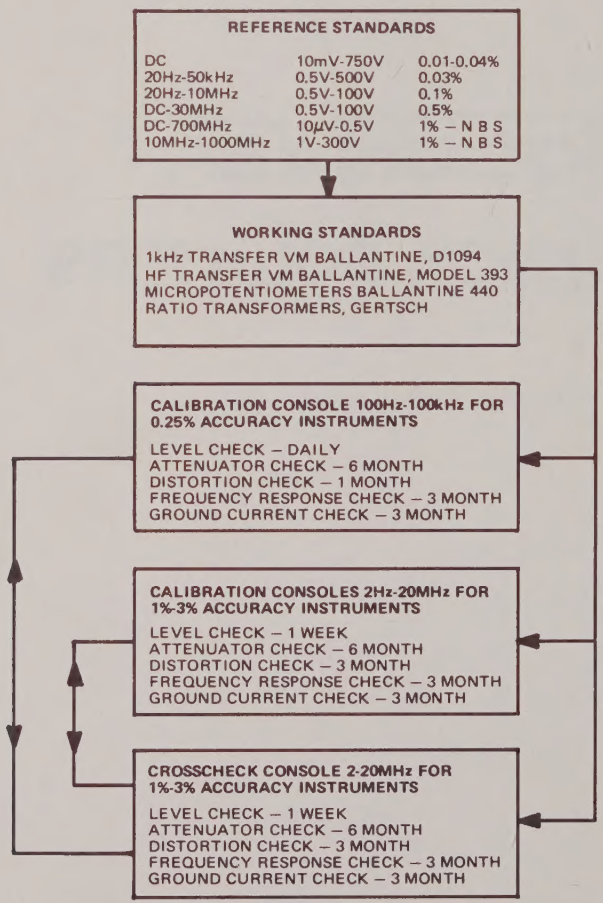
Printed in U.S.A.

WARRANTY

All Ballantine Laboratories, Inc. products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, except for vacuum tubes and batteries, or, in the case of certain major components listed in the instruction manual, for the specified period. We will repair or replace products which prove to be defective during the warranty period. No other warranty is expressed or implied. We are not liable for consequential damages.

CERTIFICATION

The equipment supplied on your order meets all applicable published Ballantine specifications as determined by thorough testing and inspection. Ballantine's calibration measurements are traceable to the National Bureau of Standards. All instruments used in calibrating Ballantine products are standardized by systematic reference to NBS-traceable standards as described in the validation procedures shown below.


REFERENCE STANDARDS
DC 10mV-750V 0.01-0.04%
20Hz-50kHz 0.5V-500V 0.03%
20Hz-10MHz 0.5V-100V 0.1%
DC-30MHz 0.5V-100V 0.5%
DC-700MHz 10μV-0.5V 1% – N B S
10MHz-1000MHz 1V-300V 1% – N B S
WORKING STANDARDS
1kHz TRANSFER VM BALLANTINE, D1094
HF TRANSFER VM BALLANTINE, MODEL 393
MICROPOTENTIOMETERS BALLANTINE 440
RATIO TRANSFORMERS, GERTSCH
CALIBRATION CONSOLE 100Hz-100kHz FOR 0.25% ACCURACY INSTRUMENTS
LEVEL CHECK – DAILY
ATTENUATOR CHECK – 6 MONTH
DISTORTION CHECK – 1 MONTH
FREQUENCY RESPONSE CHECK – 3 MONTH
GROUND CURRENT CHECK – 3 MONTH
CALIBRATION CONSOLES 2Hz-20MHz FOR 1%-3% ACCURACY INSTRUMENTS
LEVEL CHECK – 1 WEEK
ATTENUATOR CHECK – 6 MONTH
DISTORTION CHECK – 3 MONTH
FREQUENCY RESPONSE CHECK – 3 MONTH
GROUND CURRENT CHECK – 3 MONTH
CROSSCHECK CONSOLE 2-20MHz FOR 1%-3% ACCURACY INSTRUMENTS
LEVEL CHECK – 1 WEEK
ATTENUATOR CHECK – 6 MONTH
DISTORTION CHECK – 3 MONTH
FREQUENCY RESPONSE CHECK – 3 MONTH
GROUND CURRENT CHECK – 3 MONTH

Ballantine's Quality Assurance program satisfied the requirements of MIL-Q-9858.

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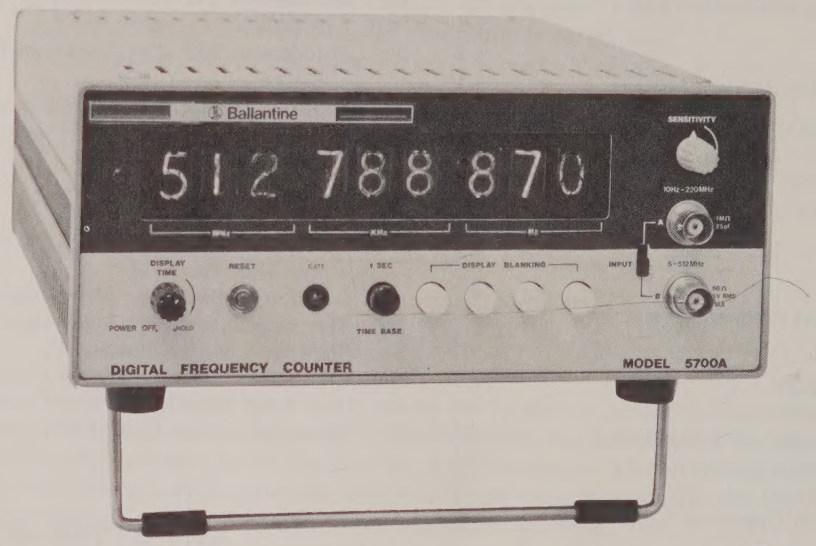


Figure 1-1. Autoconvert 512 MHz Frequency Counter 5700A

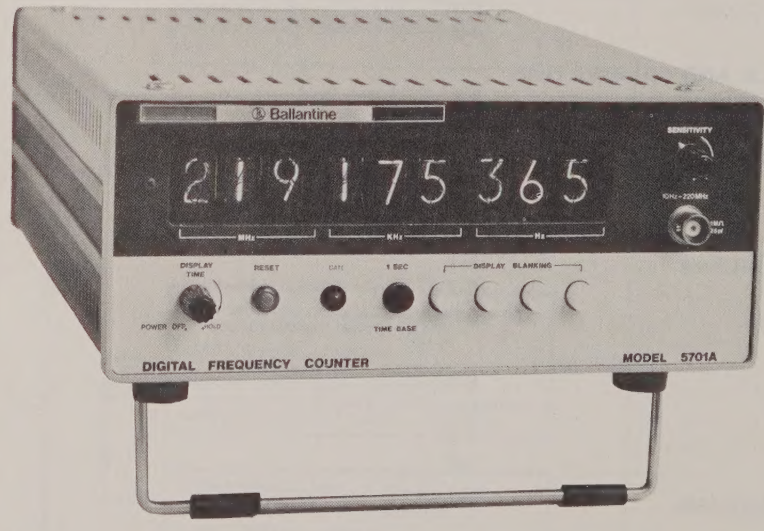


Figure 1-2. Autoconvert 220 MHz Frequency Counter 5701A

General Information

1-1. INTRODUCTION

The Ballantine Presettable Frequency Counters 5700A (Figure 1-1) and 5701A (Figure 1-2) are compact instruments for precise frequency measurements from 10 Hz to 512 MHz. Each incorporates simple controls and a "human engineered" panel layout for simple operation and maintenance. For ease of readout, the 9 digit display is divided into three 3-digit groups, labeled MHz, kHz, and Hz. Pushbutton switches on the front panel allow the selection of 5, 6, 7, 8 or 9 digits of display for frequency resolution of 10 kHz, kHz, 100 Hz, 10 Hz or Hz.

The 5700A and 5701A are essentially identical instruments except that the 5700A has an additional input channel which extends the 220 MHz measurement range beyond 512 MHz.

In addition to its characteristics as a direct frequency counter, the Ballantine 5700A and 5701A may be used in conjunction with communication receivers to measure input frequency to which the receiver is tuned. The digital counter is set to measure the local oscillator frequency. In a superhetrodyne receiver, the relationship between the receiver's local oscillator frequency (F_{LO}), the intermediate frequency (F_{IF}) and the tuned input frequency (F_{IN}) is: $F_{IN}=F_{LO}-F_{IF}$.

The 5700A or 5701A incorporates a built-in preset circuit (option 12) which automatically subtracts the intermediate frequency (F_{IF}) when measuring the local oscillator frequency (F_{LO}). The number representing F_{IF} is wired-in on a preset card. The counter then measures the receiver's local oscillator frequency to give a direct readout of the received input frequency. The receiver's local oscillator output is always of sufficient amplitude to trigger the counter while the receiver input signal level is normally of very low level. Changes in signal input amplitude or signal to noise ratio therefore do not affect the set up or accuracy of the counter measurement.

1-2. SPECIFICATIONS

Electrical and Mechanical specifications supplied and optional accessories and options available are listed in specifications Table 1-1.

1-3. INSTRUMENT AND MANUAL IDENTIFICATION

The serial number of the instrument is located on the rear panel. The three left-most digits identify instrument changes. If this prefix differs from that listed on the title page of this manual, there are differences between this manual and your instrument. Technical corrections to this manual if required are listed on an enclosed MANUAL CHANGES sheet.

Table 1-1. Specifications

FREQUENCY

Range: Channel A: 10 Mz to 220 MHz.
Channel B: 5 MHz to 512 MHz.
Input: Channel A or Channel B.
Resolution: 10 KHz to 1 Hz. The number of digits displayed may be selected as 5, 6, 7, 8, or 9.
Accuracy: ±1 count ± time-base accuracy.
Readout: Divided into three 3-digit groups labeled MHz, KHz and Hz.

FREQUENCY RATIO

Frequency Range: Channel A: 10 Hz to 220 MHz.
Channel B: 5 MHz to 512 MHz.
Channel C: 1 KHz to 1.2 MHz.
Input F1: Front Panel Channel A or Channel B.
Input F2: Rear Panel Channel C (external Clock Input).
Measures: (F1/F2) X 10^6 with 1 sec. Time Base pushbutton depressed, and (F1/F2) X 10^5 with right-most display blanking pushbutton depressed.

Accuracy: ±1 count of F1± $\frac{\text{trigger error of F2}}{10^5 \text{ or } 10^6}$
Readout: Dimensionless.

INPUT CHANNELS A, B AND C

Channel A

Impedance: 1 Megohm shunted by 25 pF approx.
Input Coupling: AC
Frequency Range: 10 Hz to 220 MHz
Sensitivity: 50 mV rms 10 Hz to 120 MHz, increasing to 200 mV rms at 220 MHz.
Attenuator: Continuously variable vernier control
Maximum Input: 600 VDC
250 V rms 10 Hz to 10 KHz.
10 V rms above 10 MHz.

Channel B

Impedance: 50 ohms nominal
Input Coupling: AC
Frequency Range: 5 MHz to 512 MHz
Sensitivity (Sinewave): <10 mV (−27 dBm) to 400 MHz; <20 mV to 512 MHz
AGC: Internal automatic gain control circuit with greater than 35 dB range. Controls amplitude of signals supplied to input amplifier.
Maximum Operating Input: 1 V rms
Maximum Continuous Input: 5 V rms

Channel C

Impedance: 1 Kohm
Input Coupling: AC
Frequency Range: 1 KHz to 1.2 MHz
Sensitivity: 0.25 V rms
Maximum Input: 50 VDC, 10 V rms AC

DISPLAY

Numerical: 9 long-life glow discharge display tubes
Units: MHz, KHz and Hz.
Display Storage: Prior reading is held while new reading is being made. Display time is adjustable from 0.2 to 5 seconds or held indefinitely.
Gate: Lights when counter gate is open.
Manual Reset: Front-panel pushbutton switch resets the display and all registers, and initiates a new measurement.

TIME BASE

Crystal Frequency: 10 MHz
Crystal Oven: Self-regulating solid-state oven.
Aging Rate: Less than 2 parts in 10^8 per day after 10 days of continuous operation.
Temperature Stability: Less than 2 parts in 10^6 from 0°C to + 50°C.
Line Voltage Stability: Less than 5 parts in 10^7 for ±10% line voltage change.
Ext. Time Base Input: Via rear panel BNC connector (Channel C)
Int. Time Base Output: 1 MHz via rear panel BNC connector. (see option 14 for high stability time base)

GENERAL

Operating Temperature: 0°C (+32°F) to + 50°C (+122°F).
Power Requirements: 115 or 230 volts ±10%. 48 to 400 Hz, 30 watts.
Dimensions: 3 1/2" (88 mm) H x 3/8" (212 mm) W x 12 1/2" (317 mm) D.
Weight: 7 pounds (3.2 Kg).
Accessories Furnished: Power cord. Instruction Manual.

ACCESSORIES AVAILABLE

Description	Part No.
50 Ω BNC Feedthrough Termination	12630D
Cable, 4 ft., 50 Ω BNC/BNC	12249D
Cable, 4 ft., 50 Ω BNC/Alligator	12250A
Cable, 6 ft., Printer-Counter Interconnect, 50-pin (Amphenol 57−30500−375 Ballantine P/N 31100370A each end).	12253A
Connector only, mating 50-pin	31100370A
Probe Kit, 6 ft., 10:1 Attenuator	10601A
Rack Mtg. Kit for 1 or 2 5700A side/side	800-04
Half-Rack Cover for Rack Kit	381000051L
Filter, Low-Pass (1 kHz)	12631A

OPTIONS AVAILABLE

Description

PRINTER OUTPUT (Option 01)
Logic: Positive true
Form: 4-line 1-2-4-8 BCD.
"1" state: +5 ±0.5 V nominal
2.5 Kohm source Z
"0" state: +0.25 V @ 1 ma.
Print Command: +5 V pulse, approx. 1 ms. duration DC coupled at end of gate time. Source Z 1 Kohm "high" and 100 ohm "low" state.
Inhibit Input: +3 V pulse minimum 50 V max. Inhibits recycling circuitry.
Connector: Amphenol 57−40500−375 (50 pin). (see accessories for interconnect cable, and mating connectors)

AUTOCONVERT (Option 03)
(Frequency Conversion − automatic subtraction of offset frequency)
Additional Program Card
Ballantine P/N 8910052−1A

HIGH STABILITY TIME BASE (Option 14)
Aging Rate: $<2/10^9$/day
Long Term Stability: $<4/10^7$/yr.
Temperature Stability: $<2/10^9$/°C
Warm-up Time: $1/10^7$ in 4 minutes.

Section 2

Installation

2-1. INTRODUCTION

The 5700A or 5701A are shipped in operating condition and ready for use. This section contains unpacking, inspection and installation information.

2-2. RECEIVING INSPECTION

Examine the shipping carton for damage before unpacking the instrument. Carefully remove the instrument from the carton. Check immediately for loose or broken control knobs, bent or broken connectors and damage to any cabinet part. If damage of any nature is found, refer to the warranty instructions and immediately make claims to the shipper and notify your local Ballantine engineering representative.

2-3. POWER CONNECTIONS

This instrument is designed to operate from either a 115 vac or 230 vac ±10% power 50 to 400 Hz source. The primary voltage selection is made by positioning a recessed slide switch on the rear panel. To change the position of the slide switch, insert a small screwdriver in the switch slot and set the switch to the required voltage position. Connecting the instrument to an incorrect power source may severely damage the unit and is reason to void the warranty.

WARNING

The instrument is provided with a three-conductor power cord which will ground the case when connected to a three-connector grounding outlet. If a grounding outlet is not available, an adapter must be used which provides a good grounding connection to earth ground.

2-4. COOLING

Cooling air enters the case through holes in the covers. Adequate clearance of approximately 5 cm (2 inches) should be provided on all sides of the instrument to allow heat to be dissipated by connection. Be sure that the instrument location permits adequate air circulation and that nearby equipment does not discharge hot air directly on the instrument.

2-5. DIGITAL RECORDER

The PRINTER connector on the rear panel provides BCD outputs and control signals for operating a digital recorder. Table 2-1 lists each of the pins in the connector. The characteristics of each input and output are given in Table 1-1.

BCD output is positive true DTL/TTL compatible. Buffering is for overload and output is ground latched until updated after inhibit input is removed.

2-6. CLOCK SELECTION

An internal 10 MHz crystal controlled precision clock is provided. There is also provision for using an external clock for increased stability or to use a special time-base. The clock selection is made by positioning of the rear panel two-position recessed slide switch *EXT CLOCK IN – 1 MHz CLOCK OUT* to 1 MHz CLOCK OUTPUT when using the internally provided clock, and to EXT CLOCK IN when using an external clock input.

2-7. AUTOCONVERT PRESET FREQUENCY SELECTION (Option 03)

The 5700A and 5701A optionally incorporate Ballantines unique built-in Autoconvert Circuit for adding or subtracting intermediate frequencies (IF) while measuring the local oscillator frequency of a communications receiver.

Before a frequency measurement is made, the counting circuits of the instrument are preset to a number which is the difference between the maximum display capability of the instrument and the IF frequency when the receivers local oscillator frequency is tuned to the sum of the tuned input frequency and the IF center frequency. The 9 digit readout has a display capability of 10^9 counts. If, for example, the IF frequency to be subtracted is 21.4 MHz, the preset should be programmed for:

kHz	Hz
1,000,	000,00
21,	400,00
978,	600,00

When the main gate opens, the counting does not start from zero, but from the preset number. After exactly 21,400,000 input counts, the counter will overflow and all digits will be at zero. The counting process continues, and when the counter's main-gate is closed by the crystal controlled clock, the count displayed will be the oscillator frequency minus the IF frequency which was preset programmed into the instrument.

If the IF frequency is to be added to the local oscillator frequency measured by the count, the preset must be programmed to the number to be added.

A rear panel slide switch permits selection of Normal or Preset mode of operation and display. Preset cards may be ordered from the factory as Ballantine P/N 8910052-1A Blank program cards are provided and the wiring is added by the user.

The preset card has 28 connecting points marked 1 to 28, which are to be connected either to the +5 Volt supply (logic "1") or to ground (logic "0"). To select a "1", a wire is to be inserted in the hole opposite the number, on the Vcc rail, and soldered on both sides of the card. To select a logic "0", the wire is to be connected to ground. The connections to be made for the required preset are given in Table 2-2. Note, that the first two least significant digits representing Hz and 10 Hz are non-presettable.

All 28 program points must be wired as required and the program card inserted with the "numbered" side facing the numeric indicators.

Table 2-1. BCD Output Connector Wiring Assignment

PIN	USE	PIN	USE
1	10^{0} Decade BCD 1 Output	26	10^{0} Decade BCD 4 Output
2	10^{0} Decade BCD 2 Output	27	10^{0} Decade BCD 8 Output
3	10^{1} Decade BCD 1 Output	28	10^{1} Decade BCD 4 Output
4	10^{1} Decade BCD 2 Output	29	10^{1} Decade BCD 8 Output
5	10^{2} Decade BCD 1 Output	30	10^{2} Decade BCD 4 Output
6	10^{2} Decade BCD 2 Output	31	10^{2} Decade BCD 8 Output
7	10^{3} Decade BCD 1 Output	32	10^{3} Decade BCD 4 Output
8	10^{3} Decade BCD 2 Output	33	10^{3} Decade BCD 8 Output
9	10^{4} Decade BCD 1 Output	34	10^{4} Decade BCD 4 Output
10	10^{4} Decade BCD 2 Output	35	10^{4} Decade BCD 8 Output
11	10^{5} Decade BCD 1 Output	36	10^{5} Decade BCD 4 Output
12	10^{5} Decade BCD 2 Output	37	10^{5} Decade BCD 8 Output
13	10^{6} Decade BCD 1 Output	38	10^{6} Decade BCD 4 Output
14	10^{6} Decade BCD 2 Output	39	10^{6} Decade BCD 8 Output
15	10^{7} Decade BCD 1 Output	40	10^{7} Decade BCD 4 Output
16	10^{7} Decade BCD 2 Output	41	10^{7} Decade BCD 8 Output
17	10^{8} Decade BCD 1 Output	42	10^{8} Decade BCD 4 Output
18	10^{8} Decade BCD 2 Output	43	10^{8} Decade BCD 8 Output
19		44	
20		45	
21		46	
22	Inhibit Input	47	
23	Positive Print Command	48	
24		49	
25		50	Ground

Table 2-2. Preset Card Programming

Preset to Number	Decade 9* Connect 1 2 3 4	Decade 8 Connect 5 6 7 8	Decade 7 Connect 9 10 11 12	Decade 6 Connect 13 14 15 16	Decade 5 Connect 17 18 19 20	Decade 4 Connect 21 22 23 24	Decade 3 Connect 25 26 27 28
0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
1	0 1 0 0	0 1 0 0	0 1 0 0	0 1 0 0	0 1 0 0	0 1 0 0	0 1 0 0
2	0 0 1 0	0 0 1 0	0 0 1 0	0 0 1 0	0 0 1 0	0 0 1 0	0 0 1 0
3	0 1 1 0	0 1 1 0	0 1 1 0	0 1 1 0	0 1 1 0	0 1 1 0	0 1 1 0
4	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0
5	1 1 0 0	1 1 0 0	1 1 0 0	1 1 0 0	1 1 0 0	1 1 0 0	1 1 0 0
6	1 0 1 0	1 0 1 0	1 0 1 0	1 0 1 0	1 0 1 0	1 0 1 0	1 0 1 0
7	1 1 1 0	1 1 1 0	1 1 1 0	1 1 1 0	1 1 1 0	1 1 1 0	1 1 1 0
8	0 0 0 1	0 0 0 1	0 0 0 1	0 0 0 1	0 0 0 1	0 0 0 1	0 0 0 1
9	0 1 0 1	0 1 0 1	0 1 0 1	0 1 0 1	0 1 0 1	0 1 0 1	0 1 0 1
		MHz		kHz			Hundreds Hz

*Decade 9 is the most significant digit representing Hundreds of MHz.

Operation

3-1. INTRODUCTION

This section will familiarize the operator with the typical operation procedures of the Ballantine Autoconvert Frequency Counters 5700A and 5701A. The front and rear panel controls, connectors and indicators are described. Recommended operating procedures demonstrate instrument flexibility.

3-2. CONTROLS, CONNECTORS AND INDICATORS

Figure 3-1 shows the instrument's front and rear panel and Table 3-1 describes the function of the elements located there. These descriptions are not intended to be operating instructions but serve to familiarize the operator with the instrument.

3-3. SENSITIVITY CONTROL ADJUSTMENT

The SENSITIVITY control permits adjustment of the input signal of Channel A to the optimum value of reliable triggering. It is not sufficient to set the control for maximum sensitivity, since the instrument may then be triggered by noise Conversely, if the trigger sensitivity level is set too low, the instrument may be triggered randomly or not at all. The optimum level is indicated by repeatability of the display. The correct procedure for setting the SENSITIVITY control is as follows:

a) Set the INPUT A/B selector (5700A only) to "A".

b) Connect the signal to the front panel BNC "A Input" connector.

c) Set the SENSITIVITY control for minimum sensitivity (fully counterclockwise). The instrument, in general, will not count in this position.

d) Rotate the SENSITIVITY control clockwise until the instrument begins to count. Check for repeatability of the display and, if necessary, continue to rotate the control clockwise until a stable display is obtained.

3-4. OPERATING PROCEDURES

Figures 3-2 and 3-3 describe operating procedures.

3-5. AUTOCONVERT PRESET OPERATION (Option 03)

The internal preset circuitry may be enabled or disabled by the PRESET ON-OFF switch on the rear panel. To enable the preset, set the PRESET switch to ON. To disable it, set the PRESET switch to OFF.

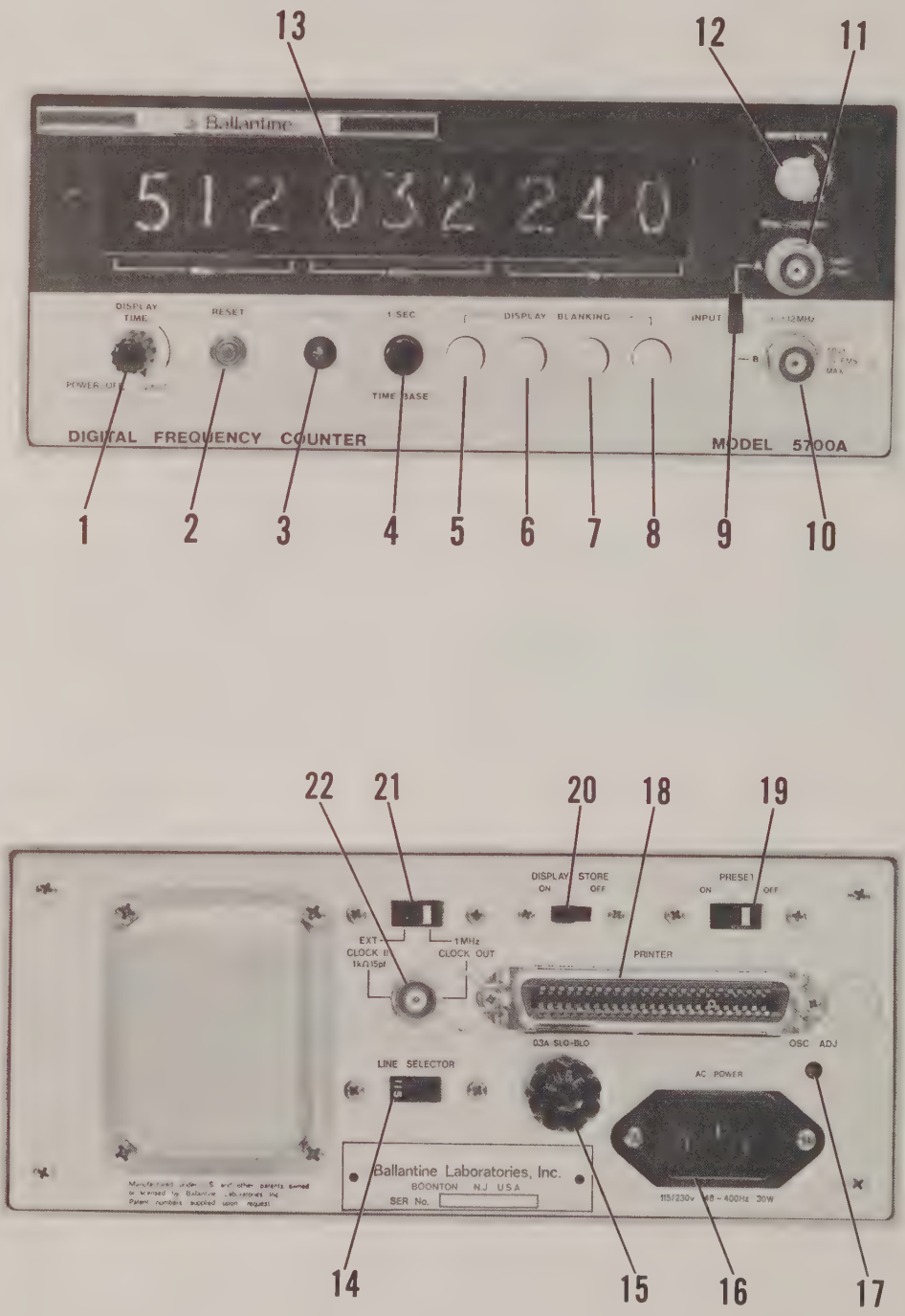
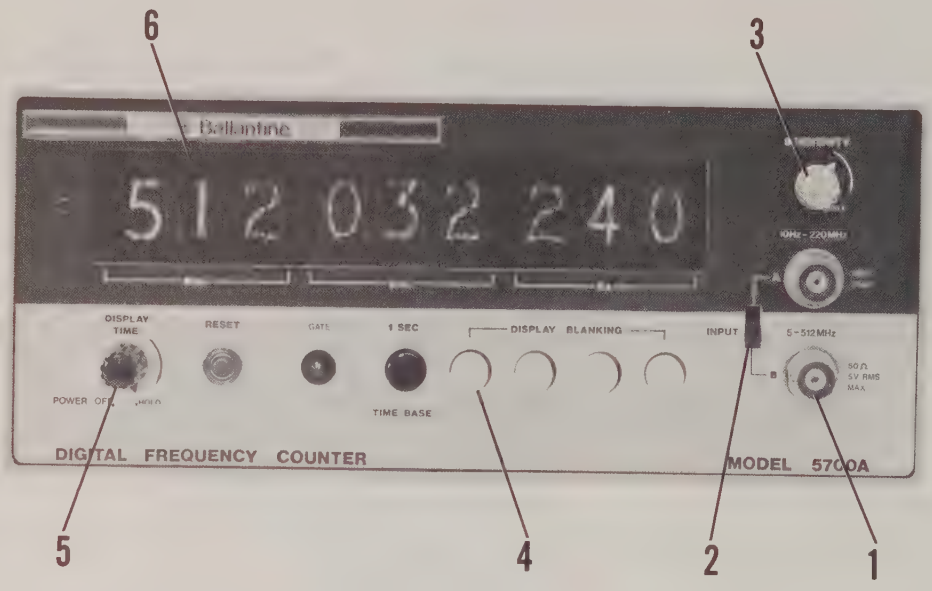


Figure 3-1. Controls, Connectors and Indicators

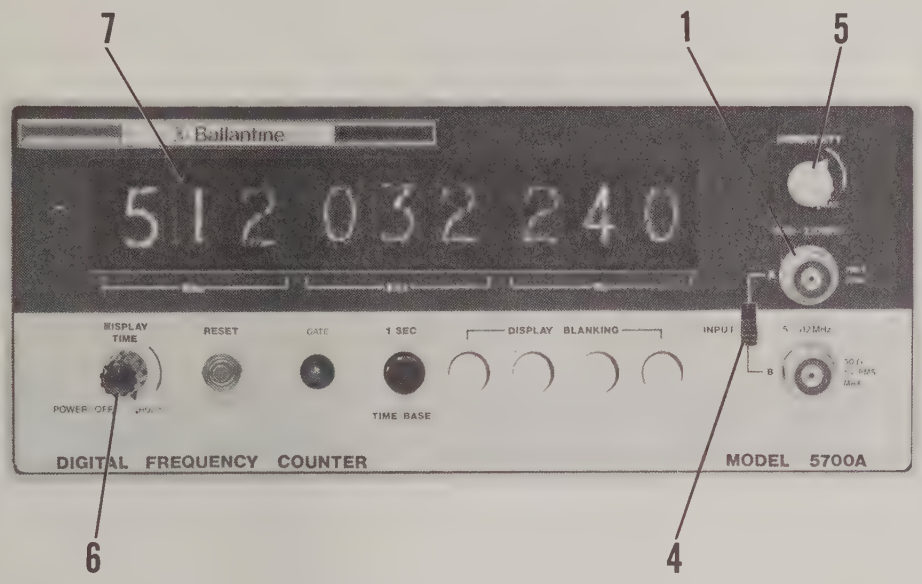
Table 3-1. Controls, Connectors and Indicators

INDEX NO	ITEM	FUNCTION
1	DISPLAY TIME Control	A switch/potentiometer control that applies ac power to the instrument, and controls the display time.
2	RESET Switch	Resets display and internal count to zero and starts a new measurement.
3	GATE Indicator	A light-emitting diode that lights up when the instrument is counting.
4	TIME BASE/1 sec Pushbutton	Selects the maximum resolution of the instrument.
5	DISPLAY BLANKING Pushbutton	Select 5 digit resolution respectively.
6	DISPLAY BLANKING Pushbutton	Select 6 digit resolution respectively.
7	DISPLAY BLANKING Pushbutton	Select 7 digit resolution respectively.
8	DISPLAY BLANKING Pushbutton	Select 8 digit resolution respectively.
9	INPUT A-B Selector	A two-position slide switch that selects either INPUT A or INPUT B (Note: Input B and this switch are only on the 5700A)
10	INPUT 5-512 MHz Connector	A BNC connector which accepts signals over a frequency range of 5 MHz to 512 MHz (5700A only).
11	INPUT 10 Hz-220 MHz Connector	A BNC connector which accepts signals over a frequency range from 10 Hz to 220 MHz.
12	SENSITIVITY Control	A potentiometer control that varies the degree of input attenuation in Channel A, thereby determining the minimum signal amplitude required to reliably trigger the instrument.
13	Display	9 digit of numeric readout.
14	LINE SELECTOR Switch	Selects the nominal power line voltage.
15	Fuse	Protects power line circuit from accidental overload by faults in the instrument.
16	AC Power Receptacle	IEC type with offset pin connected to instrument chassis. Use with standard power cord, Ballantine P/N 331-0000-0A.
17	OSC ADJ	A trimmer used for oscillator frequency adjustment. (The high-stability oscillator, Option 14, is adjustable by removing the top cover).
18	PRINTER Connector	A 50 pin connector for BCD output and digital recorder interconnection. (Option 01)
19	PRESET ON-OFF Switch	A recessed two-position slide switch used to enable or disable the autoconvert feature (Option 03).
20	STORAGE ON-OFF Switch	A two-position slide switch. When set to ON, provides display storage while new measurement is being made. In OFF position, allows continuous display.
21	INT-EXT CLOCK Switch	A recessed two-position slide switch that permits selection of either the internal clock or an external clock. When set to internal, the 1 MHz clock is available for external use thru BNC connector.
22	Clock In-Out Connector	A BNC connector that enables either the application of an external clock to the instrument or provision for the internal clock output from the instrument.



1. Connect the signal to be measured to the front panel BNC connector A or B. The Channel A frequency range is 10 Hz to 220 MHz and the Channel B range is 5 MHz to 512 MHz.
2. Set the INPUT A/B slide switch to the input Channel selected.
3. If the Channel A is operative, adjust the SENSITIVITY control as outlined in par. 3-3. The Channel B input has a built-in automatic-gain-control (AGC) circuit and requires no adjustment by the operator.
4. Select the required number of digits to be displayed by pressing one of the DISPLAY BLANKING pushbuttons. If a full 9 digit resolution is required, press the 1 sec TIME BASE pushbutton. The time base automatically adjusts to the resolution selected with shortest time base used with least resolution selected.
5. Set DISPLAY TIME control for a convenient display rate. GATE indicator flashes on and off at a rate determined by the DISPLAY TIME control setting. Instrument counts when indicator is lit.
6. The display indicates the frequency of the input signal.
7. The indicators normally should only change with changes in input frequency. Set rear input store switch to ON unless the counting cycle wants to be observed.

Figure 3-2. Operation in FREQUENCY mode



1. Connect higher frequency input (F1) to the front panel BNC connector A or B. The Channel A frequency range is 10 Hz to 220 MHz and the Channel B range is 5 MHz to 512 MHz.
2. Connect lower frequency input (F2) to the rear panel BNC connector. Frequency range for F2 is 1 kHz to 1.2 MHz.
3. Set the INT-EXT CLOCK switch to EXT CLOCK IN.
4. Set the INPUT A/B slide switch to the Channel selected.
5. If Channel A is operative, adjust the SENSITIVITY control as outlined in par. 3-3. The Channel B input has a built-in automatic-gain-control (AGC) circuit and needs no adjustment.
6. Set DISPLAY TIME control for a convenient display rate. GATE indicator flashes on and off at a rate determined by DISPLAY TIME control setting. Instrument counts when indicator is lit.
7. The display indicates non-dimensional ratio of $F1/F2 \times 10^5$ with the Hz (right-most) DISPLAY BLANKING pushbutton depressed and $F1/F2 \times 10^6$ with the 1 sec pushbutton depressed.

Figure 3-3. Operation in RATIO mode

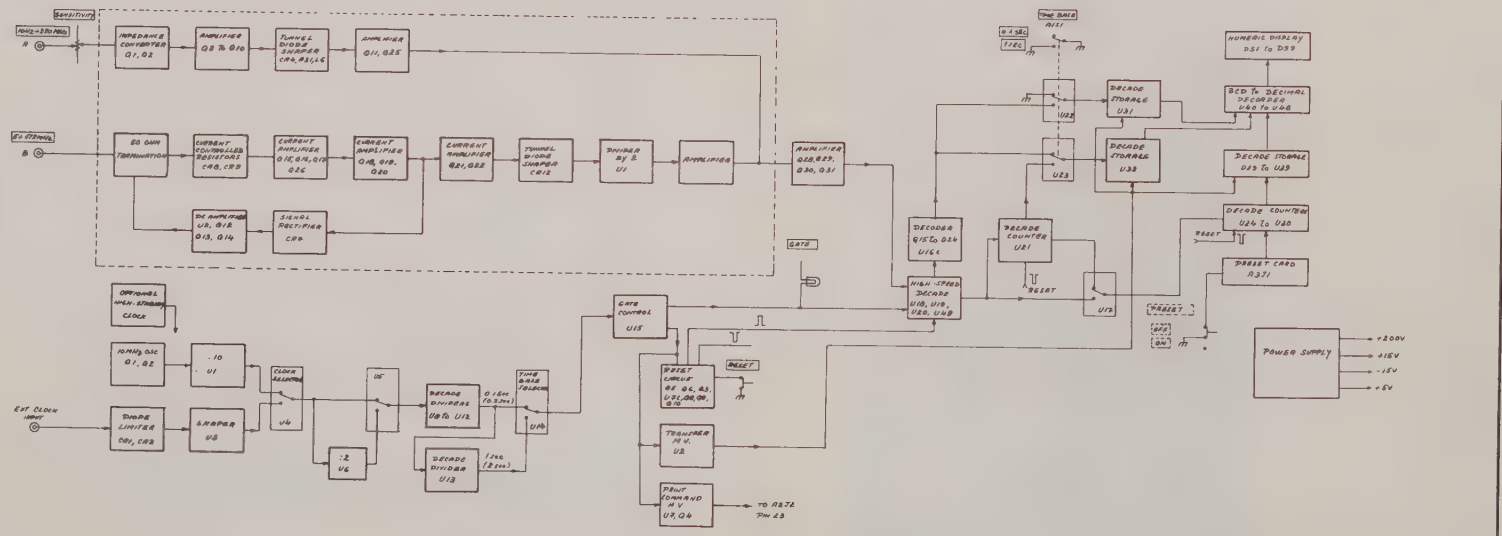


Figure 4-1. Block Diagram

Principles of Operation

4-1. INTRODUCTION

This section of the manual contains a description of the circuitry used in the 5700A and 5701A. Figure 4-1 is a detailed block diagram of the instrument. Basically, the diagram can be broken down into six functional areas. These are: the Channel A input circuit, the Channel B input circuit, the time-base circuit, the control circuit, the counting circuits and the power supply. Complete schematics are given in Section 7. Refer to these diagrams while reading the text.

4-2. ASSEMBLY DESIGNATIONS

Table 4-1 lists the designations of the assemblies used in this instrument.

4-3. CHANNEL A INPUT CIRCUIT

The input signal, 10 Hz to 220 MHz, is routed via BNC connector A1J1, and coupling capacitor A1C1 to the SENSITIVITY control A1R1. This control provides the means for varying the amount of attenuation of the Input Signal Diodes A4CR1 and A4CR2 form a bipolar limiter that protects FET A4Q1 from overload. Transistors A4Q1 and A4Q2 are connected as a source follower and drive the differential amplifier A4Q3 and A4Q4. The transistor pairs A4Q5, A4Q7 and A4Q6, A4Q8 are negative feedback amplifiers whose gain is determined by A4R17 and A4R18, and whose frequency response is set by the parallel-series RC combinations A4R17, A4C10, A4R27, A4C15 and A4R18, A4C11, A4R22, A4C14. The collectors of A4Q5 and A4Q6 are connected to the differential current amplifier A4Q9 and A4Q10. The current through A4Q10 operates tunnel-diode A4CR4 which acts as a waveform shaper. The sharp transitious of the shaped input signal are differentiated by the RL differentiator A4R31 and A4L6 and amplified by A4Q11 and A4Q25.

The 5700A and 5701A counters are direct counting to 220 MHz with A input is use.

Table 4-1. Assembly Designations

Assembly	Name	5700A	5701A
A1	Front Panel Assy	X	X
A2	Rear Panel Assy	X	X
A3	Main P.C. Board Assy	X	X
A4	"A" and "B" Input Circuit Assy	X	
A5	"A" Input Circuit Assy		X
A6	Preset Card Assy	X	X

4-4. CHANNEL B INPUT CIRCUIT (5700A only)

The input signal, 5 MHz to 512 MHz, is routed via BNC connector A1J2 to the input circuit. The pin-diodes A4CR8 and A4CR9 act as current controlled resistors which attenuate input signals exceeding the level determined by the Automatic Gain Control (AGC) circuitry.

Transistor A4Q15 forms a voltage to current converter and drives the shunt-feedback amplifier A4Q16 and A4Q26. This amplifier offers a low impedance to the collector of A4Q15 and a low impedance to the base of A4Q17. Transistor A4Q26 is connected in a common-base configuration and offers a low impedance to the collector of A4Q16 and also produces a greater degree of isolation between the open-loop input and output terminals of this stage. The second stage formed by transistors A4Q17, A4Q18 and A4Q19 is identical to the first one.

The last amplifying stage is formed by a current amplifier consisting of A4Q20, A4Q21, and A4Q22. This amplifier drives tunnel-diode shaper A4CR12. The shaped input signal is applied via emitter-follower A4Q23 to the input of the integrated circuit high-speed flip-flop A4U1. The complement outputs of A4U1 are applied via emitter-followers A4Q24 and A4Q30 to the differential current amplifier A4Q28 and A4Q29.

The AGC circuit comprises integrated circuit DC amplifier A4U2, transistors A4Q12, A4Q13, A4Q14 and associated circuitry. The amplified input signal is rectified by A4CR7, smoothed by A4R37 and A4C24 and amplified by A4U2. The minimum predetermined amplitude above which the AGC circuit starts to operate is set by A4R40. The current supplied by A4Q14 is supplied to the current controlled resistors A4CR8 and A4CR9 which in turn control the input signal amplitude applied to the input amplifiers.

B input signals are fed to high speed divide by two flip-flop and then fed to the standard counting circuits. Input switch A/B automatically selects proper time-base division by two when B input is used.

4-5. 10 MHz OSCILLATOR OPERATION

The 10 MHz oscillator consists of transistors A3Q1 and A3Q2 which serves as a buffer. A3Q1 operates as an amplifier with positive feedback. It forms a very stable crystal oscillator, which can be adjusted to exactly 10 MHz by means of trimmer capacitor A3C1.

The quartz crystal resonator is hermetically sealed in a TO-5 can and placed in a proportional oven which quickly brings the crystal to a nominal ambient temperature of 62°C. The oven is a semiconductor resistor which increases in resistance and lowers its heating effort when operating temperature is reached.

The oscillator output is fed to the decade divider A3U1.

The optional high-stability version (option 14) of the crystal oscillator clock is a precision packaged unit. It may be adjusted to the exact frequency by means of a trimmer at the top of the oscillator package.

4-6. EXT CLOCK IN/1 MHz CLOCK OUT OPERATION

BNC connector A2J1 is used as an input point for an external clock and also for the output of a 1 MHz signal from the instrument. With switch A2S1 set to 1 MHz CLOCK OUT, Nand gate A3U4B is enabled and the 1 MHz clock output from A3U1 is applied to the time-base dividers. The 1 MHz clock output is also applied to A2J1 via resistor A2R146. When the switch A2S1 is set to EXT CLOCK IN, Nand gate A3U4D is enabled and the output of the Schmitt trigger A3U3 is routed to the time-base dividers. When A3U3 is externally triggered, its input is protected against over voltage by diodes A3CR1 and A3CR2.

4-7. CONTROL LOGIC OPERATION

The control logic determines the start and stop functions for the count being taken. It also controls the routing of input and time-base signals, as well as the sequence of operation.

The time-base outputs from A3U12 or A3U13 are selected by the Nand gate selector A3U14. The selected output is applied to the input of the gate-control flip-flop A3U15A. After two consecutive clock pulses, flip-flop A3U15B is operated and its Q output goes to "low", thus inhibiting the input to A3U15A. This condition will remain until a reset pulse is applied and the Q output of A3U15B goes "high". While the gate signal from the Q output of A3U15A is "low", shaped pulses from the input circuit are counted by the counting circuits.

4-8. SAMPLE RATE AND RESET CIRCUIT

In order to ensure sufficient time for a visual readout of the measurement, a DISPLAY TIME control is provided at the front panel of the instrument. The purpose of this control is to provide a reset pulse for a selected time interval from 0.2 to 5 seconds after completion of a measurement. When the control is set to HOLD, the display is held indefinitely until the manual RESET pushbutton is depressed.

During the count interval, transistor A3Q5 is in saturation due to the "high" on its base from the main gate control circuit. At the end of the count interval, A3Q5 is cut-off and causes capacitor A3C11 to start to change. When the voltage across the capacitor reaches the firing voltage of unijunction transistor A3Q6, a negative-going pulse is produced and supplied to the Reset Multivibrator A3U7C and A3Q3. The output from A3Q3 resets all the circuits and counting registers in the instrument. A reset pulse may also be produced manually by operation of the RESET pushbutton. Setting the DISPLAY TIME control to HOLD will cause the +15V supply to be disconnected from the

DISPLAY TIME control and deactivates the automatic reset cycling. Under this condition, A3C11 will not be charged and therefore no reset pulse will be generated by the Reset multivibrator. The displayed reading will then be held indefinitely and until the manually activated Reset pushbutton initiates another single measurement.

The inhibit input on connector J2 pin 22 is normally intended for use with an external digital printer, but if necessary, it can also be used independently to provide an externally programmable form of display control. A high level at A2J2-22 will saturate transistor A3Q7 and thereby inhibit the generation of a reset pulse. Option 01 must be installed for this remote inhibit mode of operation.

4-9. GATE INDICATOR, TRANSFER AND PRINT COMMAND CIRCUITS

The GATE indicator light is operated from the output of the gate-control flip-flop A3U15A. When the output from A3U15A is low, the current through the Light Emitting Diode (LED) A3DS10 causes the diode to light to signifying that the gate is open and a measurement is in progress.

The transfer circuit generates a positive pulse which transfers the content of the counting circuits to the storage and display units. The transfer pulse is generated automatically at the end of the count interval.

The print command circuit produces a positive pulse that instructs a digital printer to record the BCD information from the display circuits. This buffer circuit comprises monostable A3U7B, A3U7A and transistor A3Q4.

4-10. COUNTING AND DISPLAY CIRCUITS

The counting and display circuits consist of nine decimal counters, memory circuits and decoders which drive numeric display tubes.

The 10^0 decimal high speed counter comprises MECL III and MECL II flip-flops U19, U20, U21 and U49, which are contained on the main board. It counts the signal on the count line and when it reaches a count of 10, it produces a carry pulse which is counted by the 10^1 decimal counter. The 10^1 counter drives the 10^2 counter, etc., in a similar manner.

The BCD output of the counters is stored by the memory circuits. With a logic "0" at the transfer terminals, the count is transfered to the decoders and is then displayed on the numeric indicators. BCD output (option 01) is buffered and latched in the memory circuits.

4-11. POWER SUPPLY

The power supply provides +200 V, ±15 V and +5 V. The instrument may be operated from a 115 volt or 230 volt ac source. Switch A2S2 provides the proper power transformer connection according to the source used.[

The +200 V output is unregulated and is the supply voltage for the display tubes.

The +15 V output is regulated and is one of the supply voltages for the input circuit. A3Q26 is a series power transistor and A3U50 provides a constant reference voltage.

The +5 V output is the supply voltage for all of the micro-logic. Q27 is the series regulator and is driven by the emitter follower A3Q12.

The −15 V output is regulated and is one of the supply voltages for the input circuit. A3Q11 and A3Q25 perform the same function as A3Q12 and Q27 in the +5 V supply. A3Q14 and A3Q13 form a differential amplifier to amplify the error voltage on the base of A3Q14.

Section 5

Maintenance and Calibration

5-1. INTRODUCTION

This section provides maintenance, calibration and service information for the 5700A and 5701A. Included are a table of recommended test equipment, input circuits adjustment, oscillator frequency adjustment and in-cabinet performance check which may be used to verify proper operation of the counter.

5-2. TEST EQUIPMENT

Recommended test equipment for troubleshooting, alignment and performance checking is listed in Table 5-1. Test instruments other than those listed may be used if their specifications equal or exceed the required characteristics.

5-3. INSTRUMENT COVER REMOVAL

To remove the top or bottom cover, unlock four quarter turn fasteners which secure cover to instrument. Then slide cover towards the top of instrument. To replace cover, reverse procedure.

WARNING

115/230 VAC and DC supply wires are exposed when either cover is removed. Disconnect the power cord while removing the covers.

5-4. CLEANING

The 5700A and 5701A should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket and prevents efficient heat dissipation.

Thoroughly clean both the inside and outside of the instrument. Remove dust from inaccessible areas with low pressure compressed air or vacuum cleaner. Use alcohol applied with a cleaning brush to remove accumulations of dirt or grease from connector contacts and component terminals. Clean the exterior of the instrument and the front panel with a mild detergent mixed with water, applying the solution with a soft, lint-free cloth.

5-5. VISUAL INSPECTION

The 5700A and 5701A should be inspected occasionally for such defects as broken connections, loose, broken or frayed wiring, dirty or pitted switch and connector contacts and cracked or broken printed circuit boards. Often, before a total or partial failure occurs, a deteriorating component can be located due to obvious discoloration, cracking or care must be taken if heat-damaged parts are located. Overheating is usally only a symptom of trouble. For this reason, it is essential to determine the actual cause of overheating before the heat-damaged part is replaced, otherwise, the damage may be repeated.

5-6. REPAIR AND REPLACEMENT

Repair and replacement of electrical and mechanical parts must be accomplished with due exercise of caution. Printed circuit component boards can become warped, cracked or burnt from excessive heat or mechanical stress. The following repair techniques are suggested to avoid inadvertant desctruction or degradation of parts and assemblies.

Use ordinary 60/40 solder and a 35 to 40-watt pencil type soldering iron on the circuit board. The tip of the iron should be clean and properly tinned for best heat transfer to the solder joint. A higher wattage soldering iron may separate the circuit from the base material. To desolder components use a commerical "solder sipper". Do not use acid core solder or acid fluxes.

Always replace a component with its exact duplicate as specified in the parts list.

5-7. IN-CABINET PERFORMANCE CHECK

The performance check outlined in the following paragraphs is used to verify the operation of the 5700A or 5701A. It may be used as:

a) Incoming inspection check of instrument specifications.
b) Periodically, for instruments used in systems.
c) Troubleshooting procedure.
d) After any repairs or adjustments and before returning instrument to regular service.

If the instrument fails to meet the standards of the performance check at any time, proceed to the appropriate adjustment procedure to correct the malfunction.

Table 5-1. Recommended Test Equipment

ITEM	REQUIREMENT	INSTRUMENT OR EQUIVALENT
1	50 kHz to 100 MHz, 5 mV to 5 Volt constant amplitude sinewave generator	Tektronix Type 191 Signal Generator
2	10 to 512 MHz VHF oscillator	HP Model 3200B
3	Oscillator 10 Mz to 100 kHz – high output level	Ballantine 5390A
4	10 Hz to 10 MHz sinewave oscillator	HP Model 651A
5	Oscilloscope having a dc to 40 MHz bandwidth and usable beyond 120 MHz	Ballantine 1040A
6	Sampling scope with a 1 GHz capability (optional)	HP 1810A
7	1 MHz frequency standard	HP Model 105 A/B
8	RF Millivoltmeter (optional)	Ballantine Model 340
9	True RMS Voltmeter	Ballantine 323L
10	Line Voltage Control Unit, Metered	General Radio W5MT3AW
11	DC Power Supply 1 V to 40 Volts	Power Designs Model 4005
12	Micropotentiometer, 5 ma 2.2 ohm resistor	Ballantine 440-05
13	Micropotentiometer 50 ma 3.3 ohm resistor	Ballantine 440-50
14	DC Millivoltmeter	Ballantine 3600A
15	50 ohms feed thru termination, BNC	Ballantine 12630A

5-7-1. Check of Counting and Display Circuits

The following check is to verify the proper operation of the counting, decoding and display circuits.

1. Set INPUT selector slide-switch on the front panel to CHANNEL A (5700A only).
2. Connect a low frequency oscillator (Table 5-1) to the input BNC of Channel A.
3. Set the STORAGE ON-OFF slide switch on the rear panel to OFF position.
4. Turn DISPLAY TIME control on the front panel slightly clockwise out of POWER OFF.
5. Press the 1 SEC TIME BASE pushbutton.
6. While the counter's gate is open, as indicated by the GATE light, set the EXT CLOCK IN – 1 MHz CLOCK OUT slide switch on the rear panel to EXT CLOCK IN. Doing this, the counter's gate will remain open until the RESET pushbutton is pressed. The counter now operates in totalize or count mode.
7. Vary the frequency from 10 Hz to 100 kHz (or to 10 MHz and 500 MHz) and verify correct counting for each individual digit.

5-7-2. BCD Output (Option 01)

This check is to verify proper operation and logic levels of the BCD output from the PRINTER connector on the rear panel. The characteristics of the BCD outputs are:

Logic: Positive true
"1" State Level: +5 ±0.5 V, 2.5 kohm source impedance
"0" State Level: +0.25 V at 1 mA sinking current

1. Set the controls and selectors same as in par. 5-7-1, 1-6.
2. Connect 40 MHz oscilloscope (Table 5-1) to the pins of the PRINTER connector as given in Table 2-1 and verify "0" and "1" state levels.
3. Perform test of 5-7-1 above to advance digits

Use: 10 Hz to check the 10^0 decade
100 Hz to check the 10^1 decade
1 kHz to check the 10^2 decade
10 kHz to check the 10^3 decade
100 kHz to check the 10^4 decade
1 MHz to check the 10^5 decade
10 MHz to check the 10^6 decade
100 MHz to check the 10^7 and 10^8 decades

Use: 10 Hz to check the 10^0 decade
100 Hz to check the 10^1 decade
1 kHz to check the 10^2 decade
10 kHz to check the 10^3 decade
100 kHz to check the 10^4 decade
1 MHz to check the 10^5 decade
10 MHz to check the 10^6 decade
100 MHz to check the 10^7 and 10^8 decades

5-7-3. BCD Output, Print Command (Option 01)

The characteristics of the print command are: Positive pulse of 5 volt, DC coupled. Source impedance is 1 kohm when in the "high" state and 100 ohm when in the "low" state. Pulse duration is 1 msec approx. The print command occurs when a count cycle is completed as signified by the closing of the gate.

1. Set the clock selector slide-switch on the rear panel to 1 MHz CLOCK OUT.
2. Turn the DISPLAY TIME control slightly clockwise out of POWER OFF.
3. Set INPUT selector to CHANNEL A (5700A)
4. Press one of the DISPLAY BLANKING pushbuttons.
5. Connect the oscilloscope to pin 23 of the PRINTER BCD output blue ribbon connector. The oscilloscope should display the print command pulse after each closing of the counter's gate, as indicated by the extinguished GATE light.

5-7-4. PRINTER, Inhibit Input (Option 01)

The inhibit input signal characteristics are:

1. Set the controls, same as in par. 5-7-3, 1 to 4.
2. Connect a positive dc voltage to pin 22 of PRINTER connector 3 V to 50 V, and verify that the recycling circuitry of the counter is inhibited, as indicated by the GATE light.

NOTE

Carefully monitor rms output voltage of oscillators used in counter sensitivity checks 5-7-5 and 5-7-6 as well as in calibration procedures 5-8-1 and 5-8-2. Although an RF millivoltmeter may be used, it is recommended that an rms responding micropotentiometer be employed for best precision in these VHF and UHF tests. (See typical test setup).

5-7-5. Input Sensitivity, Channel A

To verify the input sensitivity of the Channel A, proceed as follows:

1. Set INPUT selector slide-switch to "A".
2. Set the SENSITIVITY control to maximum sensitivity (fully clockwise).
3. Turn DISPLAY TIME control slightly clockwise out of POWER OFF.
4. Connect a low frequency oscillator (Table 5-1) to the Channel A input.
5. Vary the frequency of the oscillator from 10 Hz to 10 MHz, keeping output constant at 50 mV rms. Counter should properly display the frequencies in this range.
6. Substitute VHF oscillator (Table 5-1) for the low frequency oscillator.
7. Vary the frequency of the VHF oscillator from 10 MHz to 220 MHz, keeping output constant at 50 mV rms up to 120 MHz and increasing linearly to 200 mV rms at 220 MHz. Counter should properly display the frequencies in this range.

5-7-6. Input Sensitivity, Channel B (5700A)

To verify the input sensitivity of Channel B, proceed as follows:

1. Set INPUT selector slide-switch to "B".
2. Turn DISPLAY TIME control slightly clockwise out of POWER OFF.
3. Connect VHF oscillator (Table 5-1) to the Channel B input.
4. Vary the frequency of the oscillator from 10 MHz to 400 MHz, keeping output constant at 10 mV rms. From 400 MHz to 500 MHz keep output constant at 20 mV rms.
   Counter should properly display the frequencies in this range. Repeat as above with LF oscillator from 5 MHz to 10 MHz and observe proper operation.

5-7-7. Input Sensitivity, EXT CLOCK IN (rear panel)

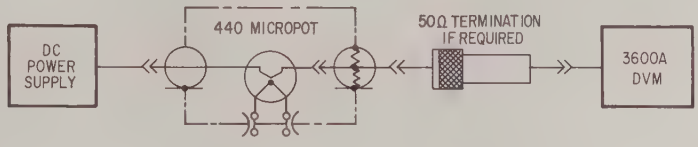
To verify the input sensitivity of Channel C (EXT CLOCK IN), proceed as follows:

1. Set INPUT selector slide-switch to "A".
2. Turn DISPLAY TIME Control slightly clockwise out of POWER OFF.
3. Connect a 10 MHz signal to Channel A. The exact frequency of the signal is of no importance.
4. Connect a low frequency signal generator (Table 5-1) to the EXT CLOCK IN connector.
5. Set the slide switch to EXT CLOCK IN.
6. Vary the frequency of the low frequency oscillator from 1.2 MHz to 1 kHz, keeping output constant at 250 mV rms. Counter should properly display the ratio of the frequencies in this range. Please note, that the lower the frequency, the longer the gate time.

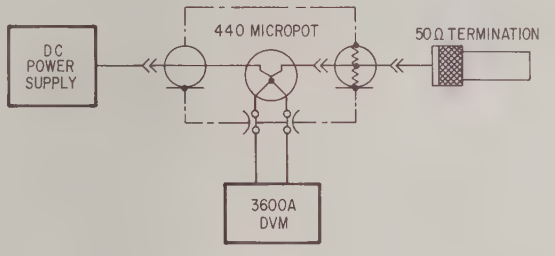
5-8. ALIGNMENT PROCEDURE

The following paragraphs detail the alignment procedure used to calibrate the 5700A or 5701A for correct operation. The location of alignment controls and test points is shown in Section 7.

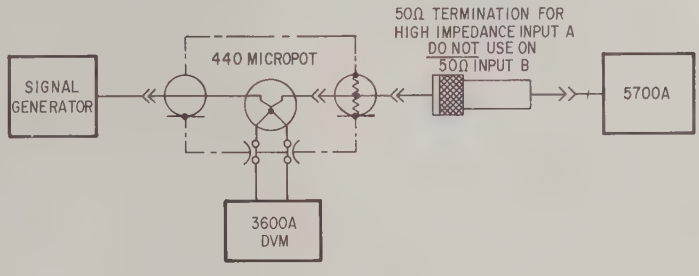
Step I. DC Calibrate Micropot. Vary DC Input until desired output voltage is read on DVM



Step II. Leave DC supply and load of Step I and measure and record couple output voltage



Step III. Adjust signal generator output to give same DVM reading as in Step II. The rms input to counter is same as dc DVM reading in Step I.



NOTES

1. Use 50 ohm termination to provide proper loading for micropot setup (Step I and Step II) only when using the micropot on high impedance input A of the 5700A and 5701A and leave in place for Step III measurements.

2. Use 50 ohm termination to provide proper loading for micropot setup (Step I and Step II) and then remove and connect micropot directly to 50 ohm Input B on 5700A. The internal 50 ohm termination on "B" Input takes the place of the external 50 ohm termination.

3. Take extreme care in making these measurements since highly accurate UHF low level signals are involved. A 5 mA Micropot with 2.7 ohm precision resistor is recommended for the 10 and 20 mV UHF measurements. Consider that the input capacitive loading on the high impedance "A" Input has an Xc in the low 20 ohms so that it must be driven from a low resistance source if micropot current reading is to develop an accurate VHF calibration voltage. Use a 50 mA micropot with a 3.3 ohm precision resistor to calibrate "A" input at 120 MHz (< 50 mV rms) and 220 MHz (200 mV – for short time use – keep below 150 mV max for routine measurements).

Figure 5-1. Typical Test Setup

5-8-1. Input Circuit Adjustment, Channel A

1. Connect a 120 MHz sinewave signal, 100 mV rms, to Channel A input BNC connector.
2. Adjust the front panel SENSITIVITY control for maximum sensitivity (fully clockwise).
3. Connect an oscilloscope (Table 5-1) to the collector of Q25.
4. Adjust trimpot R24 for maximum symmetry.
5. Reduce the input signal amplitude until the waveform observed on the oscilloscope becomes erratic. Then slightly increase the input signal amplitude and readjust trimpot R24.

5-8-2. Input Circuit Adjustment, Channel B (5700A only)

The Channel B has no adjustment, except for the Automatic Gain Control (AGC) circuit which controls the input signal amplitude applied to the input amplifier.

1. Connect a 30 MHz sinewave signal 100 mV rms to Channel B input.
2. Connect an oscilloscope across resistor R93 (100 ohm).
3. Adjust trimpot R40 for an amplitude of 600 mV peak-to-peak across R93.
4. Increase 30 MHz signal input amplitude to 200 mV rms. Verify that the amplitude of 600 mV peak-to-peak is maintained across R93.

5-8-3. High-Speed-Decade Driver Adjustment

The high-speed-decade driver is formed by transistors Q28, Q29, Q30 and Q31, located on the main P.C. board. The output of emitter-follower Q31 is compatible with MECL III input requirements, and should be normally "high" when no signal is applied to the driver. To adjust for correct operation proceed as follows:

1. Connect an oscilloscope, DC coupled, to the emitter of Q31.
2. Slowly turn trimpot R65, starting from the fully counter-clockwise position. The emitter voltage at the start of rotation should be 4.2 Volts (approx.).
3. Just before the voltage begins to drop, stop the clockwise rotation of the trimpot. Then turn the pot back in a counterclockwise direction for about 10 degrees.

   Note: Slight readjustment may be necessary for correct operation at 512 MHz.

5-9. OSCILLATOR CALIBRATION

1. Trigger the oscilloscope from 1 MHz (Table 5-1) frequency standard.
2. Observe 1 MHz signal from 1 MHz CLOCK OUT BNC on the rear panel of the 5700A or 5701A on the vertical axes of the oscilloscope.
3. Adjust OSC ADJ trimmer on the rear panel of the 5700A or 5701A with a plastic screwdriver until pattern on the oscilloscope stops drifting. It is important that this adjustment is made after at least 24 hours of continuous operation.
4. Instead of scope time-base triggering phase/frequency comparison, X-Y lissajous figure measurements are recommended as the preferred method to perform clock frequency adjustments.

For instruments equipped with the High-Stability Oscillator (option 14), the adjustment is made inside the instrument after removal of the top cover. Allow 48 hours of warm up prior to frequency adjustment of the high stability oscillator.

NOTE

NBS WWV standard frequency transmissions may also be used with a phase comparator system. Monitoring frequency drift with a chart recorder for an extended time period also a recommended technique.

Parts List

The replacement parts listed are available from the vendors listed or from Ballantine Labs. at the address shown above. Your local Ballantine Field Engineering Representative may also carry a stock of parts and can assist you. If pricing quotations are required for parts and or repairs your local representative will give the most rapid service or you may contact the Ballantine Factory directly.

When ordering replacement parts always give the following information:

a) Instrument Model number
b) Serial number
c) Ballantine Part number
d) Schematic Symbol number
e) Identification of the part

Ballantine will do its best to improve the instrument and make changes in style of components and replacement parts. Replacement parts may differ in appearance from those found in your instrument but are always equal or superior in performance. Where necessary minor mechanical modifications may be required in the replacement of components.

Parts are generally available locally for most replacements. The parts list calls out the recommended vendors where applicable.

The following parts coding are used:

CVC	Capacitor, Variable, Ceramic
CCT	Capacitor, Ceramic, Tubular
CFP	Capacitor, Fixed, Plastic
CCD	Capacitor, Ceramic, Disc
CYF	Capacitor, Mylar, Foil
CMD	Capacitor, Mica, Dipped
CMM	Capacitor, Mica, Molded
CEA	Capacitor, Electrolytic, Aluminum
CET	Capacitor, Electrolytic, Tantalum
DGP	Diode, General Purpose
DZG	Diode, Zener, General Purpose
DRP	Diode, Bridge, Power
FLT	Filter
ICP	Integrated Circuit
TRQ	Transistor
RFF	Resistor, Fixed, Film
RFC	Resistor, Fixed, Composition
RVC	Resistor, Variable, Composition
RFW	Resistor, Fixed, Wirewound
SWG	Switch
LMB	Lamp
TRX	Transformer

Resistors may generally be replaced by Corning Electronics (CGW) type N-55 and C-32. Allen Bradley composition resistors type EB are also used.

FRONT PANEL A1

SCHEM REF	BALLANTINE PART NO	DESCRIPTION	MFR CODE	MFR PART NUMBER
DS 1	16100000A	LMP PAN GALIUM ARSENIDE	28480	(HP)-5082-4440
J 1	31033790A	CON UG-1094/U,DAGE	29587	STATE ELECT.PARTS
R 1	09100501A	RVC 1.0 M/SWITCH-MIN POT	50423	
R 2	09400011A	RVC 250.0 K .25W LOG SPST	50423	
S 1	25400240A	SWC PUSH-BUTTON - FIVE	50423	
S 2	25100220A	SWC SLIDE MIN DPDT	78488	STACKPOLE SS-91-1
S 3	25100020A	SWC MOM PB SPST NO	81073	GRAYHILL 30-1(0130-15)

REAR PANEL A2

SCHEM REF	BALLANTINE PART NO	DESCRIPTION	MFR CODE	MFR PART NUMBER
F 1	19028030A	FUS 0.3 A SLO-BLO	75915	LTF 3AG-0.3 OR EQUIV.
J 1	31033790A	CON UG-1094/U,DAGE	29587	STATE ELECT.PARTS
J 2	31095130A	CON BLUE RIBBON,PANEL MTG.	29587	50 PIN, AMPHENOL 57-4050
S 1	25100220A	SWC SLIDE MIN DPDT	78488	STACKPOLE SS-91-1
S 2	25077860A	SWC LINE VOLTAGE-SLIDE	82389	SWITCHCRAFT #46256LF
S 4	25077860A	SWC LINE VOLTAGE-SLIDE	82389	SWITCHCRAFT #46256LF
S 5	25077860A	SWC LINE VOLTAGE-SLIDE	82389	SWITCHCRAFT #46256LF
T 1	20400050A	TRX PWR XFORM	50423	

MAIN ASSEMBLY A3

SCHEM REF	BALLANTINE PART NO	DESCRIPTION	MFR CODE	MFR PART NUMBER
C 1	07100120A	CMD 100.0PF 100 V J DIPMICA	84171	ARCO TYPE RDM15-101J
C 2	07100870A	CMD 390.0PF 100 V J	84171	ARCO TYPE RDM15-391J
C 3	07100110A	CMD 24.0PF 100 V J DIPMICA	84171	ARCO TYPE RDM15-240J
C 4	07100100A	CVC 7-25PF 300 V TRIMMER	72982	ERIE 538-006-B7-25 PCMON
C 5	07095750A	CCD 220 PF 600 V K 10%	71590	CTL TYP DD-721
C 6	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 7	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C 8	07100820A	CCD 0.1UF 50. V	84171	ARCO TYPE CY30-C-1042
C 9	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C 10	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C 11	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 12	07100890A	CCD 4.7NF 500 V	34553	AMPEREX C023B501E222P
C 13	07100890A	CCD 4.7NF 500 V	34553	AMPEREX C023B501E222P
C 14	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C 15	07100890A	CCD 4.7NF 500 V	34553	AMPEREX C023B501E222P
C 16	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 17	07100890A	CCD 4.7NF 500 V	34553	AMPEREX C023B501E222P
C 18	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 19	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C 20	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C 21	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C 22	07093540A	CEA 16 UF K	73445	AMP TYP C426AR/D16
C 23	07100920A	CEA 470.0UF 35. V	50423	STET-TRUSH ERO EGK470/35
C 24	07095610A	CCD 1 NF 1 KV K 10%	84171	ARC TYP CCS-102
C 25	07100930A	CEA 100.0UF 16 V UPPC MNT	50423	STETNER TRUCH ERO EK4701
C 26	07100940A	CEA 2.2NF 16 V	50423	STETNER TRUSH ERO EGK
C 27	07100940A	CEA 2.2NF 16 V	50423	STETNER TRUSH ERO EGK
C 28	07100930A	CEA 100.0UF 16 V UPPC MNT	50423	STETNER TRUCH ERO EK4701

MAIN ASSEMBLY A3 (Continued)

SCHEM REF		BALLANTINE PART NO	D E S C R I P T I O N	MFR CODE	MFR PART NUMBER
C	29	07100910A	CEA 470.0UF 6.3 V UPPC MNT	50423	STETNER TRUSH ERO EK470/
C	30	07100920A	CEA 470.0UF 35. V	50423	STET-TRUSH ERO EGK470/35
C	31	07100950A	CEA 220.0UF 35 V STANDOFF	50423	STETNER TRUSH ERO EBK
C	32	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	33	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	34	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C	35	07100930A	CEA 100.0UF 16 V UPPC MNT		STETNER TRUCH ERO EK4701
C	36	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	37	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	38	07022410A	CMM 15 PF 500 V J 5%	84171	ARCO TYPE CM15-C-150-J
C	39	07095520A	CCD 100 PF 1 KV K 10%	84171	ARC TYP CCD-101
C	40	07100060A	CCD 4.7PF 500 V DISC	90201	RMC TYPE CG
C	41	07101090A	CSF 2.7NF 500.0 VJ POLY.FL	71590	CRL CPR2700J
C	42	07101090A	CSF 2.7NF 500.0 VJ POLY.FL	71590	CRL CPR2700J
C	43	07101090A	CSF 2.7NF 500.0 VJ POLY.FL	71590	CRL CPR2700J
C	44	07100850A	CCD 22.0PF 500 V	90201	RMC TYPE CG
C	45	07100850A	CCD 22.0PF 500 V	90201	RMC TYPE CG
C	46	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	47	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	48	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	49	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	50	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	51	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	52	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	53	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	54	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	55	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	56	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	57	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	58	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	59	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C	60	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
CR	1	05100260A	DGP 1N4151 SILICON	24446	GE
CR	2	05100260A	DGP 1N4151 SILICON	24446	GE
CR	3	05100350A	DZG 10.0V 200.0MW IN758A	04713	MOTOROLA
CR	4	05094810A	DGP IN4005	04713	MOTOROLA
CR	5	05094910A	DGP IN4003	04713	MOTOROLA
CR	6	05094910A	DGP IN4003	04713	MOTOROLA
CR	7	05100270A	DRP 1N4999 SILICON POWER	04713	MOTOROLA
CR	8	05100270A	DRP 1N4999 SILICON POWER	04713	MOTOROLA
CR	9	05094910A	DGP IN4003	04713	MOTOROLA
CR	10	05094910A	DGP IN4003	04713	MOTOROLA
CR	11	05100340A	DZG 4.3V 200.0MW IN749A	04713	MOTOROLA
DS	1	21100000A	TBE NIXIE NUMERIC	83594	BURROUGHS
DS	2	21100000A	TBE NIXIE NUMERIC	83594	BURROUGHS
DS	3	21100000A	TBE NIXIE NUMERIC	83594	BURROUGHS
DS	4	21100000A	TBE NIXIE NUMERIC	83594	BURROUGHS
DS	5	21100000A	TBE NIXIE NUMERIC	83594	BURROUGHS
DS	6	21100000A	TBE NIXIE NUMERIC	83594	BURROUGHS
DS	7	21100000A	TBE NIXIE NUMERIC	83594	BURROUGHS
DS	8	21100000A	TBE NIXIE NUMERIC	83594	BURROUGHS
DS	9	21100000A	TBE NIXIE NUMERIC	83594	BURROUGHS
Q	1	10100330A	TRQ 2N3646 NPN	04713	MOTOROLA
Q	2	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA
Q	3	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA
Q	4	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA
Q	5	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA
Q	6	10100360A	TRQ 2N4852 UNIJUNCTION	04713	MOTOROLA
Q	7	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA
Q	8	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA

SCHEM REF		BALLANTINE PART NO	DESCRIPTION	MFR CODE	MFR PART NUMBER
Q	9	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA
Q	10	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA
Q	11	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	12	10100320A	TRQ 2N1613 NPN	04713	MOTOROLA
Q	13	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	14	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	15	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	16	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	17	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	18	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	19	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	20	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	21	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	22	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	23	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	24	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	25	10100100A	TRQ TRANSISTOR TYPE MJE 370	04713	MOTOROLA
Q	26	10100040A	TRQ NPN 30V 25W SI MJE520	04713	MOTOROLA
Q	27	10100040A	TRQ NPN 30V 25W SI MJE520	04713	MOTOROLA
Q	28	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	29	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	30	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	31	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
R	1	12125000A	RFF 0100.0K 250 MW F +- 1%	16299	COR TYP NA 55
R	2	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	3	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R	4	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R	5	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R	6	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	7	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R	8	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R	9	12124320A	RFF 0021.5K 250 MW F +- 1%	16299	COR TYP NA 55
R	10	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R	11	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	12	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R	13	12122520A	RFF 0348.00 250 MW F +- 1%	16299	COR TYP NA 55
R	14	12124000A	RFF 0010.0K 250 MW F +- 1%	16299	COR TYP NA 55
R	15	12123880A	RFF 8250.00 250 MW F +- 1%	16299	COR TYP NA 55
R	16	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	17	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	18	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	19	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R	20	12122520A	RFF 0348.00 250 MW F +- 1%	16299	COR TYP NA 55
R	21	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R	22	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	23	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R	24	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R	25	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	26	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R	27	12124520A	RFF 0034.8K 250 MW F +- 1%	16299	COR TYP NA 55
R	28	12124160A	RFF 0014.7K 250 MW F +- 1%	16299	COR TYP NA 55
R	29	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	30	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	31	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R	32	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R	33	12122560A	RFF 0383.00 250 MW F +- 1%	16299	COR TYP NA 55
R	34	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R	35	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R	36	12122560A	RFF 0383.00 250 MW F +- 1%	16299	COR TYP NA 55
R	37	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55

SCHEM REF	BALLANTINE PART NO	DESCRIPTION	MFR CODE	MFR PART NUMBER
R 38	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 39	12122160A	RFF 0147.00 250 MW F +- 1%	16299	COR TYP NA 55
R 40	12121160A	RFF 0014.70 250 MW F +- 1%	16299	COR TYP NA 55
R 41	12127200A	RFC 1.0 500.0MWJ	01121	TYPE EB
R 42	12123400A	RFF 2610.00 250 MW F +- 1%	16299	COR TYP NA 55
R 43	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 44	12123880A	RFF 8250.00 250 MW F +- 1%	16299	COR TYP NA 55
R 45	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 46	12122880A	RFF 0825.00 250 MW F +- 1%	16299	COR TYP NA 55
R 47	12124000A	RFF 0010.0K 250 MW F +- 1%	16299	COR TYP NA 55
R 48	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 49	12123400A	RFF 2610.00 250 MW F +- 1%	16299	COR TYP NA 55
R 50	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 51	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 52	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R 53	12123400A	RFF 2610.00 250 MW F +- 1%	16299	COR TYP NA 55
R 54	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 55	12124080A	RFF 0012.1K 250 MW F +- 1%	16299	COR TYP NA 55
R 56	12127070A	RFC 68.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 57	12123160A	RFF 1470.00 250 MW F +- 1%	16299	COR TYP NA 55
R 58	12127090A	RFC 180.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 59	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 60	12127030A	RFC 33.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 61	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 62	12127110A	RFC 270.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 63	12127090A	RFC 180.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 64	12123160A	RFF 1470.00 250 MW F +- 1%	16299	COR TYP NA 55
R 65	09100450A	RVC 1.0 K PC TRIMPOT 5500A	32997	BOURNS 3329H SERIES
R 66	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 67	12122520A	RFF 0348.00 250 MW F +- 1%	16299	COR TYP NA 55
R 68	12127030A	RFC 33.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 69	12127030A	RFC 33.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 70	12122320A	RFF 0215.00 250 MW F +- 1%	16299	COR TYP NA 55
R 71	12122240A	RFF 0178.00 250 MW F +- 1%	16299	COR TYP NA 55
R 72	12122400A	RFF 0261.00 250 MW F +- 1%	16299	COR TYP NA 55
R 73	12122880A	RFF 0825.00 250 MW F +- 1%	16299	COR TYP NA 55
R 74	12122880A	RFF 0825.00 250 MW F +- 1%	16299	COR TYP NA 55
R 75	12122880A	RFF 0825.00 250 MW F +- 1%	16299	COR TYP NA 55
R 76	12122880A	RFF 0825.00 250 MW F +- 1%	16299	COR TYP NA 55
R 77	12122880A	RFF 0825.00 250 MW F +- 1%	16299	COR TYP NA 55
R 78	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 79	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 80	12121520A	RFF 0034.80 250 MW F +- 1%	16299	COR TYP NA 55
R 81	12122320A	RFF 0215.00 250 MW F +- 1%	16299	COR TYP NA 55
R 82	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 83	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 84	12121520A	RFF 0034.80 250 MW F +- 1%	16299	COR TYP NA 55
R 85	12122320A	RFF 0215.00 250 MW F +- 1%	16299	COR TYP NA 55
R 86	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 87	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 88	12122320A	RFF 0215.00 250 MW F +- 1%	16299	COR TYP NA 55
R 89	12121520A	RFF 0034.80 250 MW F +- 1%	16299	COR TYP NA 55
R 90	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 91	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 92	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 93	12122320A	RFF 0215.00 250 MW F +- 1%	16299	COR TYP NA 55
R 94	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 95	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 96	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 97	12122320A	RFF 0215.00 250 MW F +- 1%	16299	COR TYP NA 55
R 98	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R 99	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55

MAIN ASSEMBLY A3 (Continued)

SCHEM REF	BALLANTINE PART NO	DESCRIPTION	MFR CODE	MFR PART NUMBER
R 100	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 101	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 102	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 103	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 104	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 105	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 106	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 107	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 108	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 109	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 110	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 111	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 112	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 113	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 114	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 115	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 116	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 117	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 118	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 119	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 120	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 121	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 122	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 123	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 124	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 125	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 126	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 127	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 128	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 129	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 130	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 131	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 132	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 133	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 134	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 135	12123320A	RFF 2150.00 250 MW F +- 1%	16299	COR TYP NA 55
R 136	12124320A	RFF 0021.5K 250 MW F +- 1%	16299	COR TYP NA 55
R 137	12124320A	RFF 0021.5K 250 MW F +- 1%	16299	COR TYP NA 55
R 138	12124320A	RFF 0021.5K 250 MW F +- 1%	16299	COR TYP NA 55
R 139	12124320A	RFF 0021.5K 250 MW F +- 1%	16299	COR TYP NA 55
R 140	12124320A	RFF 0021.5K 250 MW F +- 1%	16299	COR TYP NA 55
R 141	12124320A	RFF 0021.5K 250 MW F +- 1%	16299	COR TYP NA 55
R 142	12124320A	RFF 0021.5K 250 MW F +- 1%	16299	COR TYP NA 55
R 143	12124320A	RFF 0021.5K 250 MW F +- 1%	16299	COR TYP NA 55
R 144	12124320A	RFF 0021.5K 250 MW F +- 1%	16299	COR TYP NA 55
R 145	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 146	12127050A	RFC 47.0 125 MW J	01121	A-8 1/8 W OR EQUIV.
R 147	12123720A	RFF 5620.00 250 MW F +- 1%	16299	COR TYP NA 55
R 148	12121000A	RFF 0010.00 250 MW F +- 1%	16299	COR TYP NA 55
R 149	12092540A	RCF 11.5 500 MW F+- 1%	00656	ARV TYP CPX-1/2
R 150	12123060A	RFF 1150.00 250 MW F +- 1%	16299	COR TYP NA 55
U 1	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U 2	24100170A	ICP 7410 TTL TRIP 3-INP	07263	FAIRCHILD
U 3	24100040A	TCD SN7472N	01295	TEXAS INSTRUMENT

MAIN ASSEMBLY A3 (Continued)

SCHEM REF		BALLANTINE PART NO	D E S C R I P T I O N	MFR CODE	MFR PART NUMBER
U	4	24094070A	ICP T.I.SN7400N OR	56289	SPRAGUE USN7400A
U	5	24094070A	ICP T.I.SN7400N OR	56289	SPRAGUE USN7400A
U	6	24094090A	ICP T.J. SN7473N OR	56289	SPRAGUE USN7473A
U	7	24100170A	ICP 7410 TTL TRIP 3-INP	07263	FAIRCHILD
U	8	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	9	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	10	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	11	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	12	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	13	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	14	24094070A	ICP T.I.SN7400N OR	56289	SPRAGUE USN7400A
U	15	24100320A	ICP 745112 DUAL JK SCHOTTKY	01245	TEXAS INSTRUMENT
U	16	24094070A	ICP T.I.SN7400N OR	56289	SPRAGUE USN7400A
U	17	24100300A	ICP 7400 TTL SCHOTTKY	01295	TEXAS INSTRUMENT
U	18	24100370A	ICP MC1034P ECL	04713	MOTOROLA
U	19	24100370A	ICP MC1034P ECL	04713	MOTOROLA
U	20	24100370A	ICP MC1034P ECL	04713	MOTOROLA
U	21	24100260A	ICP 8290 TTL DEC-COUNTER	18324	SIGNETICS
U	22	24100250A	ICP 9322 TTL QUAD 2 MLTX	04713	MOTOROLA
U	23	24100250A	ICP 9322 TTL QUAD 2 MLTX	04713	MOTOROLA
U	24	24100260A	ICP 8290 TTL DEC-COUNTER	18324	SIGNETICS
U	25	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	26	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	27	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	28	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	29	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	30	24100140A	ICP 8280 TTL DEC.CTR	18324	SIGNETICS
U	31	24100150A	ICP 7475 TTL	18324	SIGNETICS
U	32	24100150A	ICP 7475 TTL	18324	SIGNETICS
U	33	24100150A	ICP 7475 TTL	18324	SIGNETICS
U	34	24100150A	ICP 7475 TTL	18324	SIGNETICS
U	35	24100150A	ICP 7475 TTL	18324	SIGNETICS
U	36	24100150A	ICP 7475 TTL	18324	SIGNETICS
U	37	24100150A	ICP 7475 TTL	18324	SIGNETICS
U	38	24100150A	ICP 7475 TTL	18324	SIGNETICS
U	39	24100150A	ICP 7475 TTL	18324	SIGNETICS
U	40	24100130A	ICP 7441	18324	SIGNETICS
U	41	24100130A	ICP 7441	18324	SIGNETICS
U	42	24100130A	ICP 7441	18324	SIGNETICS
U	43	24100130A	ICP 7441	18324	SIGNETICS
U	44	24100130A	ICP 7441	18324	SIGNETICS
U	45	24100130A	ICP 7441	18324	SIGNETICS
U	46	24100130A	ICP 7441	18324	SIGNETICS
U	47	24100130A	ICP 7441	18324	SIGNETICS
U	48	24100130A	ICP 7441	18324	SIGNETICS
U	49	24100390A	ICP ECL MC1670L	04713	MOTOROLA
U	50	24094210A	ICP FAIRCHILD UA723C	07263	#U5R7723393
Y	1	04400030A	CRS 10.0MHZ TO-5	50423	TABOR 08000000 ALSO ERC
O		42100000A	OVN OVEN SEMI CON TO-5 20V	01295	ULIXON TEXAS INST. MST1-

INPUT CIRCUITS A4

SCHEM REF	BALLANTINE PART NO	DESCRIPTION	MFR CODE	MFR PART NUMBER
C 1	07095520A	CCD 100 PF 1 KV K 10%	84171	ARC TYP CCD-101
C 2	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 3	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 4	07100850A	CCD 22.0PF 500 V	90201	RMC TYPE CG
C 5	07078160A	CEA 47 UF 20 V K 10%	56289	SPRAGUE 150D476X9020R2
C 6	07101110A	CCD 47.0PF 500V	90201	RMC TYPE CG
C 7	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 8	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 9	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 10	07100810A	CCD 3.3PF 500. V	90201	RMC TYPE GG
C 11	07100810A	CCD 3.3PF 500. V	90201	RMC TYPE GG
C 12	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 13	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 14	07100850A	CCD 22.0PF 500 V	90201	RMC TYPE CG
C 15	07100850A	CCD 22.0PF 500 V	90201	RMC TYPE CG
C 16	07101110A	CCD 47.0PF 500V	90201	RMC TYPE CG
C 17	07022410A	CMM 15 PF 500 V J 5%	84171	ARCO TYPE CM15-C-150-J
C 18	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 19	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 20	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 21	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 22	07095610A	CCD 1 NF 1 KV K 10%	84171	ARC TYP CCS-102
C 23	07023550A	CCD 22 NF 200 V K 10%	92741	GOODALL TYPE 621M
C 24	07100530A	CET 10.0UF 35.0V M	56289	SPRAGUE 1960106X0035A3
C 25	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 26	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 27	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 28	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 29	07100850A	CCD 22.0PF 500 V	90201	RMC TYPE CG
C 30	07100850A	CCD 22.0PF 500 V	90201	RMC TYPE CG
C 31	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 32	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 33	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 34	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 35	07100830A	CET 1.5UF 35 V DISC	56289	SPRAGUE 1960155X0035A3
C 36	07022410A	CMM 15 PF 500 V J 5%	84171	ARCO TYPE CM15-C-150-J
C 37	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 38	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 39	07022410A	CCM 15.0PF 500V J 5%	84171	ARCO TYPE CM-15-C-150-J
C 40	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 41	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 42	07100850A	CCD 22.0PF 500 V	90201	RMC TYPE CG
C 43	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 44	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 45	07100060A	CCD 4.7PF 500 V DISC	90201	RMC TYPE CG
C 46	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 47	07100810A	CCD 3.3PF 500. V	90201	RMC TYPE GG
C 48	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 49	07100850A	CCD 22.0PF 500 V	90201	RMC TYPE CG
C 50	07100060A	CCD 4.7PF 500 V DISC	90201	RMC TYPE CG
C 51	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 52	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 53	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 54	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 55	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 56	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 57	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 58	07022410A	CMM 15 PF 500 V J 5%	84171	ARCO TYPE CM15-C-150-J
C 59	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C 60	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M

INPUT CIRCUITS A4 (Continued)

SCHEM REF		BALLANTINE PART NO	DESCRIPTION	MFR CODE	MFR PART NUMBER
C	61	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C	62	07022410A	CMM 15 PF 500 V J 5%	84171	ARCO TYPE CM15-C-150-J
C	63	NOT USED			
C	64	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C	65	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C	66	07022410A	CMM 15 PF 500 V J 5%	84171	ARCO TYPE CM15-C-150-J
C	67	07022410A	CMM 15 PF 500 V J 5%	84171	ARCO TYPE CM15-C-150-J
C	68	07100530A	CET 10.0UF 35.0V M	56289	SPRAGUE 1960106X0035A3
C	69	07022410A	CMM 15 PF 500 V J 5%	84171	ARCO TYPE CM15-C-150-J
C	70	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C	71	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C	72	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C	73	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
C	74	07101120A	CCC 100.0NF 50.V CHIP	50423	W050FH104M
CR	1	05100260A	DGP 1N4151 SILICON	24446	GE
CR	2	05100260A	DGP 1N4151 SILICON	24446	GE
CR	3	05094940A	DZG 1N756, 8.2V	04713	MOTOROLA
CR	4	05100360A	DTV TD253	24446	GE SILICON TD-253
CR	5	05100340A	DZG 4.3V 200.0MW IN749A	04713	MOTOROLA
CR	6	05094620A	DGP HPA 2800	28480	HEWLETT-PACKARD
CR	7	05094620A	DGP HPA 2800	28480	HEWLETT-PACKARD
CR	8	05100370A	DXS HP 3080 SILICON PIN	28440	HP 5082-3080
CR	9	05100370A	DXS HP 3080 SILICON PIN	28440	HP 5082-3080
CR	10	05094940A	DZG 1N756, 8.2V	04713	MOTOROLA
CR	11	05094940A	DZG 1N756, 8.2V	04713	MOTOROLA
CR	12	05100360A	DTV TD253	24446	GE SILICON TD-253
CR	13	05100350A	DZG 10.0V 200.0MW IN758A	04713	MOTOROLA
CR	14	05100350A	DZG 10.0V 200.0MW IN758A	04713	MOTOROLA
CR	15	05100340A	DZG 4.3V 200.0MW IN749A	04713	MOTOROLA
L	1	46100030A	FRB FER BD CERAMAG 24	78488	STACKPOLE 571355
L	2	46100030A	FRB FER BD CERAMAG 24	78488	STACKPOLE 571355
L	3	46100030A	FRB FER BD CERAMAG 24	78488	STACKPOLE 571355
L	4	46100030A	FRB FER BD CERAMAG 24	78488	STACKPOLE 571355
L	5	46100030A	FRB FER BD CERAMAG 24	78488	STACKPOLE 571355
Q	1	10100380A	TRQ 2N5459 FET MPF 105	04713	MOTOROLA
Q	2	10079340A	TRQ 2N3640	07263	FAIRCHILD
Q	3	10100330A	TRQ 2N3646 NPN	04713	MOTOROLA
Q	4	10100330A	TRQ 2N3646 NPN	04713	MOTOROLA
Q	5	10100330A	TRQ 2N3646 NPN	04713	MOTOROLA
Q	6	10100330A	TRQ 2N3646 NPN	04713	MOTOROLA
Q	7	10079340A	TRQ 2N3640	07263	FAIRCHILD
Q	8	10079340A	TRQ 2N3640	07263	FAIRCHILD
Q	9	10079340A	TRQ 2N3640	07263	FAIRCHILD
Q	10	10079340A	TRQ 2N3640	07263	FAIRCHILD
Q	11	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	12	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA
Q	13	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA
Q	14	10100350A	TRQ 2N4126 PNP	04713	MOTOROLA
Q	15	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	16	10079340A	TRQ 2N3640	07263	FAIRCHILD
Q	17	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	18	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	19	10079340A	TRQ 2N3640	07263	FAIRCHILD
Q	20	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	21	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	22	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	23	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	24	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	25	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	26	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q	27	10100340A	TRQ 2N4124 NPN	04713	MOTOROLA
Q	28	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA

SCHEM REF	BALLANTINE PART NO	DESCRIPTION	MFR CODE	MFR PART NUMBER
Q 29	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
Q 30	10100370A	TRQ 2N5179 NPN 2N5179	04713	MOTOROLA
R 1	12125000A	RFF 0100.0K 250 MW F +- 1%	16299	COR TYP NA 55
R 2	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 3	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 4	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R 5	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 6	12122400A	RFF 0261.00 250 MW F +- 1%	16299	COR TYP NA 55
R 7	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 8	12127010A	RFC 22.0 125 MW J +-5,	01121	A-B 1/8 W OR EQUIV.
R 9	12127010A	RFC 22.0 125 MW J +-5,	01121	A-B 1/8 W OR EQUIV.
R 10	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 11	12123400A	RFF 2610.00 250 MW F +- 1%	16299	COR TYP NA 55
R 12	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 13	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 14	12122800A	RFF 0681.00 250 MW F +- 1%	16299	COR TYP NA 55
R 15	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 16	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 17	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 18	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 19	12123080A	RFF 1210.00 250 MW F +- 1%	16299	COR TYP NA 55
R 20	12123080A	RFF 1210.00 250 MW F +- 1%	16299	COR TYP NA 55
R 21	12124080A	RFF 0012.1K 250 MW F +- 1%	16299	COR TYP NA 55
R 22	12127100A	RFC 220.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 23	12122520A	RFF 0348.00 250 MW F +- 1%	16299	COR TYP NA 55
R 24	09100440A	RVC 500.0 PC TRIMPOT 5700A	32997	BOURNS 3329H SERIES
R 25	12122520A	RFF 0348.00 250 MW F +- 1%	16299	COR TYP NA 55
R 26	12124080A	RFF 0012.1K 250 MW F +- 1%	16299	COR TYP NA 55
R 27	12127100A	RFC 220.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 28	12122720A	RFF 0562.00 250 MW F +- 1%	16299	COR TYP NA 55
R 29	12127010A	RFC 22.0 125 MW J +-5,	01121	A-B 1/8 W OR EQUIV.
R 30	12127010A	RFC 22.0 125 MW J +-5,	01121	A-B 1/8 W OR EQUIV.
R 31	12127050A	RFC 47.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 32	12123160A	RFF 1470.00 250 MW F +- 1%	16299	COR TYP NA 55
R 33	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 34	12127010A	RFC 22.0 125 MW J +-5,	01121	A-B 1/8 W OR EQUIV.
R 35	12125000A	RFF 0100.0K 250 MW F +- 1%	16299	COR TYP NA 55
R 36	12125000A	RFF 0100.0K 250 MW F +- 1%	16299	COR TYP NA 55
R 37	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 38	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R 39	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R 40	09100510A	RVF 10.0 K TRIMPUT	32997	BOURNS 3007P-1-103
R 41	12125240A	RFF 0178.0K 250 MW F +- 1%	16299	COR TYP NA 55
R 42	12124640A	RFF 0046.4K 250 MW F +- 1%	16299	COR TYP NA 55
R 43	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 44	12121000A	RFF 0010.00 250 MW F +- 1%	16299	COR TYP NA 55
R 45	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 46	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 47	12123640A	RFF 4640.00 250 MW F +- 1%	16299	COR TYP NA 55
R 48	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 49	12121000A	RFF 0010.00 250 MW F +- 1%	16299	COR TYP NA 55
R 50	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 51	12124000A	RFF 0010.0K 250 MW F +- 1%	16299	COR TYP NA 55
R 52	12122320A	RFF 0215.00 250 MW F +- 1%	16299	COR TYP NA 55
R 53	12122320A	RFF 0215.00 250 MW F +- 1%	16299	COR TYP NA 55
R 54	12122320A	RFF 0215.00 250 MW F +- 1%	16299	COR TYP NA 55
R 55	12122320A	RFF 0215.00 250 MW F +- 1%	16299	COR TYP NA 55
R 56	12122720A	RFF 0562.00 250 MW F +- 1%	16299	COR TYP NA 55
R 57	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 58	12127120A	RFC 470.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 59	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 60	12123560A	RFF 3830.00 250 MW F +- 1%	16299	COR TYP NA 55

INPUT CIRCUITS A4 (Continued)

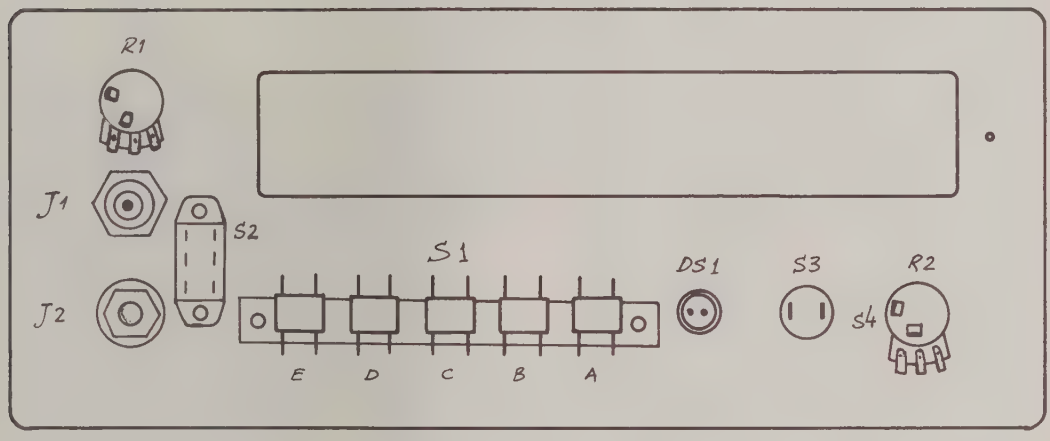
SCHEM REF	BALLANTINE PART NO	DESCRIPTION	MFR CODE	MFR PART NUMBER
R 61	12124000A	RFF 0010.0K 250 MW F +- 1%	16299	COR TYP NA 55
R 62	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 63	12127080A	RFC 100.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 64	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 65	12123240A	RFF 1780.00 250 MW F +- 1%	16299	COR TYP NA 55
R 66	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 67	12123160A	RFF 1470.00 250 MW F +- 1%	16299	COR TYP NA 55
R 68	12123080A	RFF 1210.00 250 MW F +- 1%	16299	COR TYP NA 55
R 69	12127120A	RFC 470.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 70	12122720A	RFF 0562.00 250 MW F +- 1%	16299	COR TYP NA 55
R 71	12121640A	RFF 0046.40 250 MW F +- 1%	16299	COR TYP NA 55
R 72	12127100A	RFC 220.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 73	12122200A	RFF 0162.00 250 MW F +- 1%	16299	COR TYP NA 55
R 74	12123160A	RFF 1470.00 250 MW F +- 1%	16299	COR TYP NA 55
R 75	12127080A	RFC 100.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 76	12123240A	RFF 1780.00 250 MW F +- 1%	16299	COR TYP NA 55
R 77	12122200A	RFF 0162.00 250 MW F +- 1%	16299	COR TYP NA 55
R 78	12123080A	RFF 1210.00 250 MW F +- 1%	16299	COR TYP NA 55
R 79	12127120A	RFC 470.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 80	12122720A	RFF 0562.00 250 MW F +- 1%	16299	COR TYP NA 55
R 81	12121640A	RFF 0046.40 250 MW F +- 1%	16299	COR TYP NA 55
R 82	12127100A	RFC 220.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 83	12127070A	RFC 68.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 84	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 85	12122200A	RFF 0162.00 250 MW F +- 1%	16299	COR TYP NA 55
R 86	12122200A	RFF 0162.00 250 MW F +- 1%	16299	COR TYP NA 55
R 87	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 88	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 89	12127030A	RFC 33.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 90	12123160A	RFF 1470.00 250 MW F +- 1%	16299	COR TYP NA 55
R 91	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 92	12122640A	RFF 0464.00 250 MW F +- 1%	16299	COR TYP NA 55
R 93	12127080A	RFC 100.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 94	12127030A	RFC 33.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 95	12121640A	RFF 0046.40 250 MW F +- 1%	16299	COR TYP NA 55
R 96	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 97	12127030A	RFC 33.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 98	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 99	12122000A	RFF 0100.00 250 MW F +- 1%	16299	COR TYP NA 55
R 100	12123240A	RFF 1780.00 250 MW F +- 1%	16299	COR TYP NA 55
R 101	12127050A	RFC 47.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 102	12127050A	RFC 47.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 103	12123160A	RFF 1470.00 250 MW F +- 1%	16299	COR TYP NA 55
R 104	12127050A	RFC 47.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 105	12124160A	RFF 0014.7K 250 MW F +- 1%	16299	COR TYP NA 55
R 106	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 107	12123520A	RFF 3480.00 250 MW F +- 1%	16299	COR TYP NA 55
R 108	12123000A	RFF 1000.00 250 MW F +- 1%	16299	COR TYP NA 55
R 109	NOT USED			
R 110	12121640A	RFF 0046.40 250 MW F +- 1%	16299	COR TYP NA 55
R 111	12121640A	RFF 0046.40 250 MW F +- 1%	16299	COR TYP NA 55
R 112	12127050A	RFC 47.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
R 113	NOT USED			
R 114	12123160A	RFF 1470.00 250 MW F +- 1%	16299	COR TYP NA 55
R 115	12122060A	RFF 0115.00 250 MW F +- 1%	16299	COR TYP NA 55
R 116	12123160A	RFF 1470.00 250 MW F +- 1%	16299	COR TYP NA 55
R 117	12127030A	RFC 33.0 125 MW J	01121	A-B 1/8 W OR EQUIV.
U 1	24100430A	ICP VHF COUNTER	50423	PLESSY SP-602-B
U 2	24094200A	ICP FAIRCHILD MA741C	07263	#U5B7741393

Notes

Circuit Diagrams

This section contains component location illustrations and schematics for the 5700A and 5701A. The component location illustrations identify, by reference designation, the location of all components shown on the schematics.

All the components shown on the schematics and component location illustrations are described in the parts list in Section 6. Any replacement parts required should be selected from the parts list.



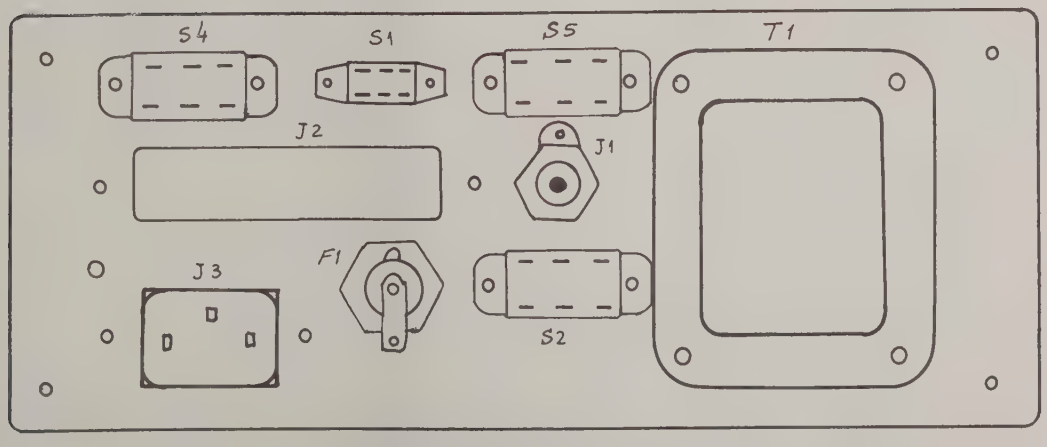


Figure 7-1. Component Locations, Front Panel A1 and Rear Panel A2

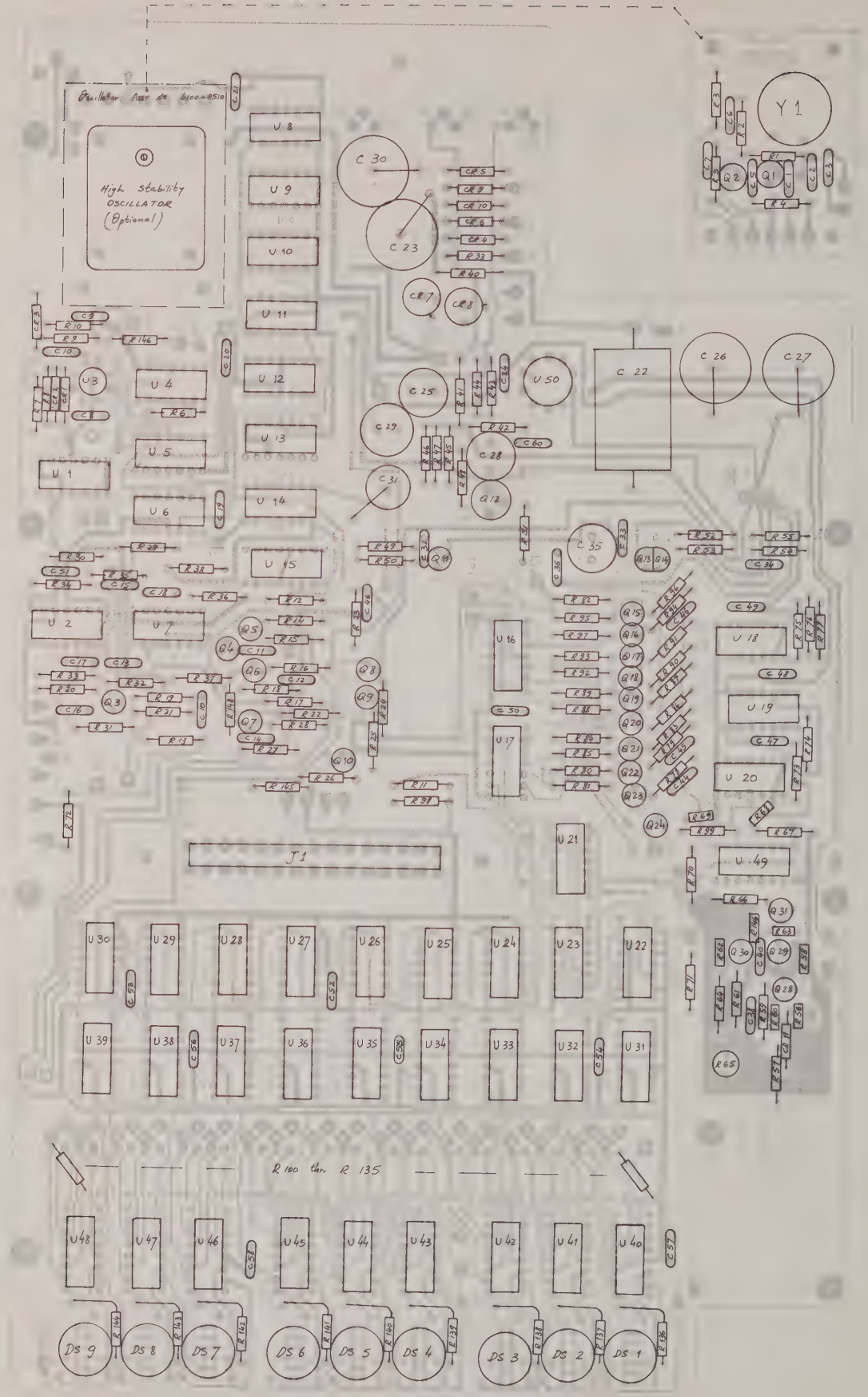
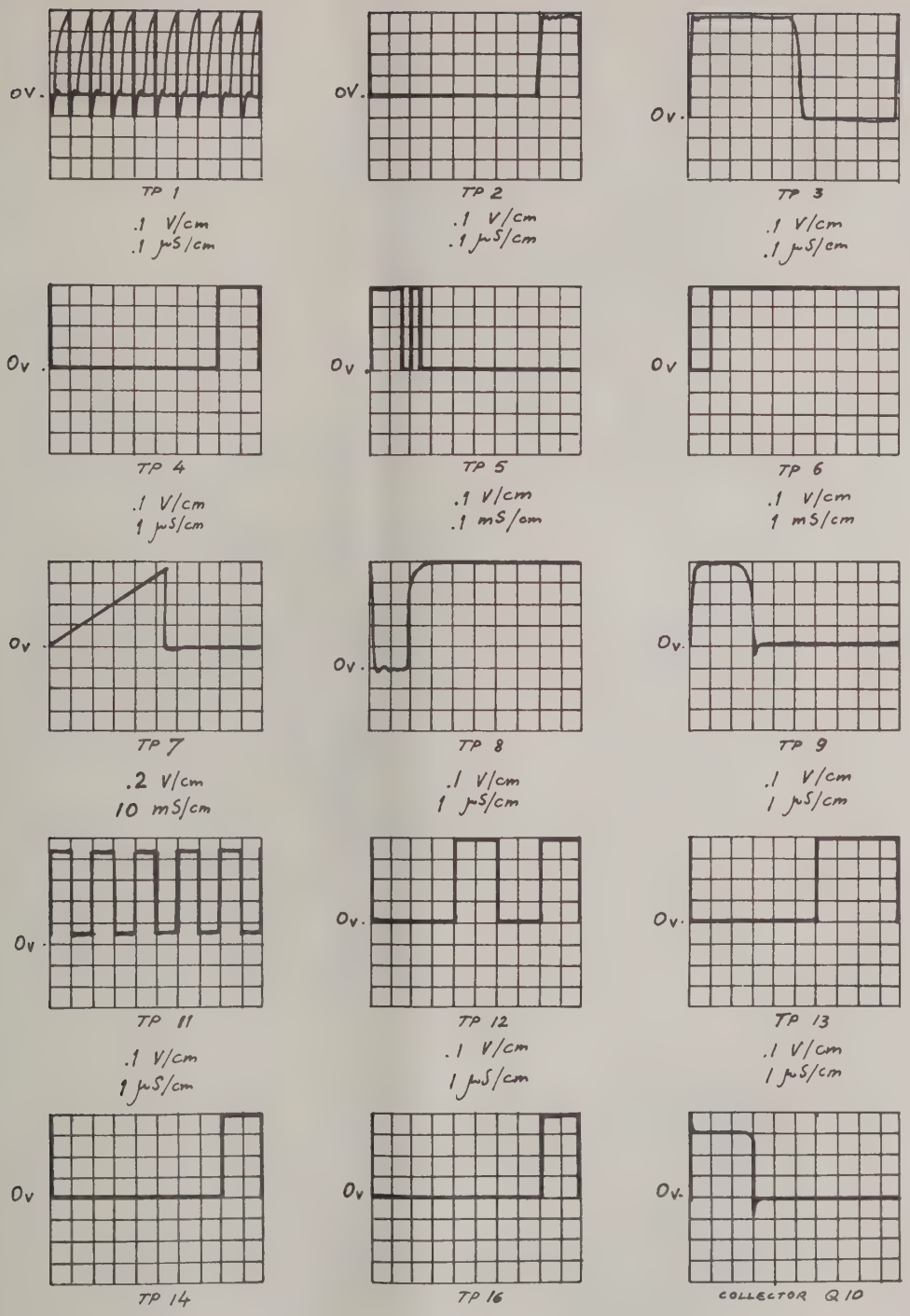


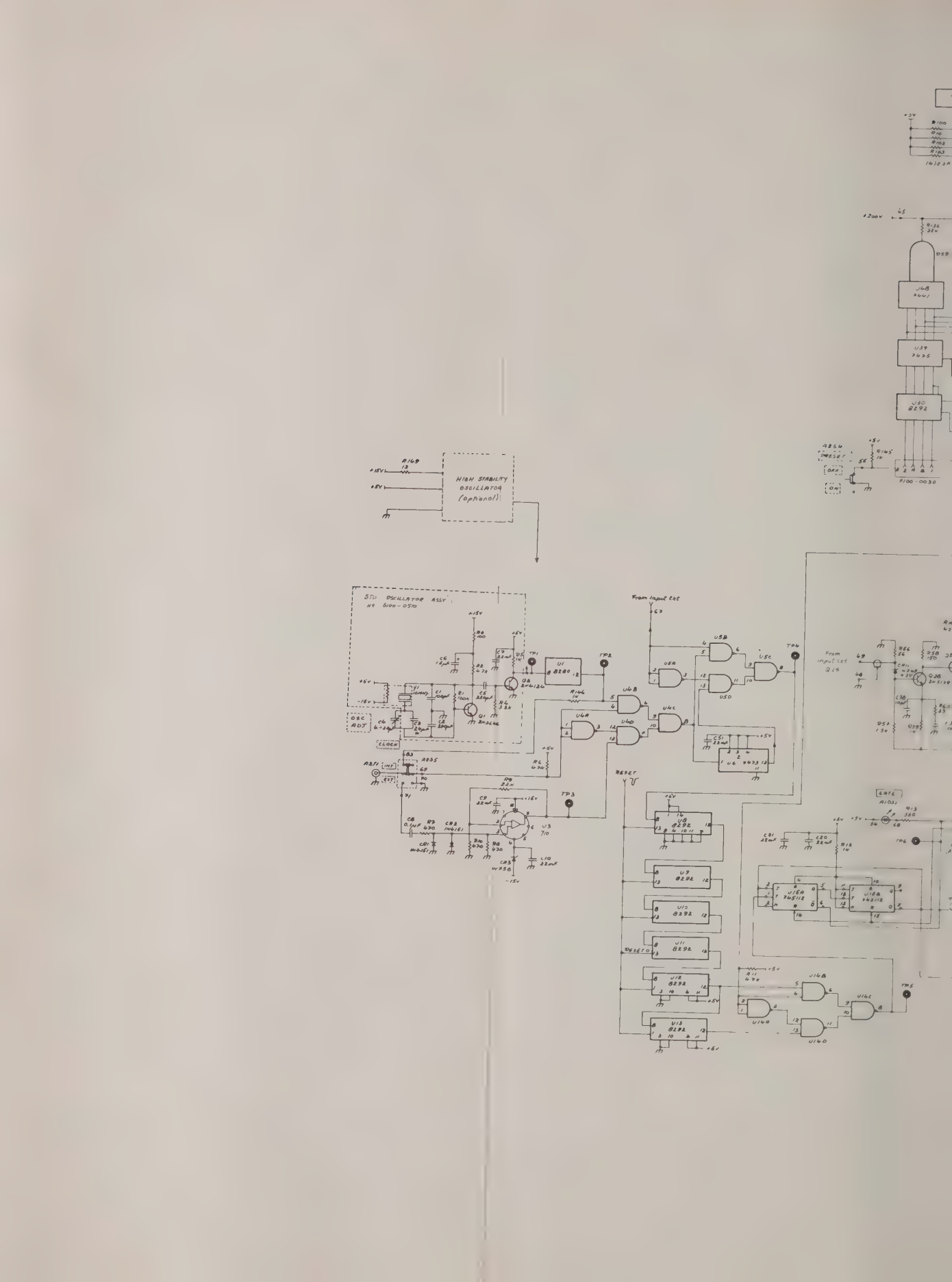
Figure 7-2. Component Locations, Main Assembly A3



All waveforms dc coupled through 10:1 divider probe.
Input A Jack connected to 1 MHz clock output on rear panel.

Counter Controls:
Input – A
Time Base – 1 sec
Display Time – min

Figure 7-3. Test Point Waveforms, Main Assembly A3


HIGH STABILITY OSCILLATOR (optional)
STD OSCILLATOR ASSY
From input ckt
From input ckt
RESET
GATE
SELECT
OSC ADJ
CLOCK
OFF
ON
PRESET

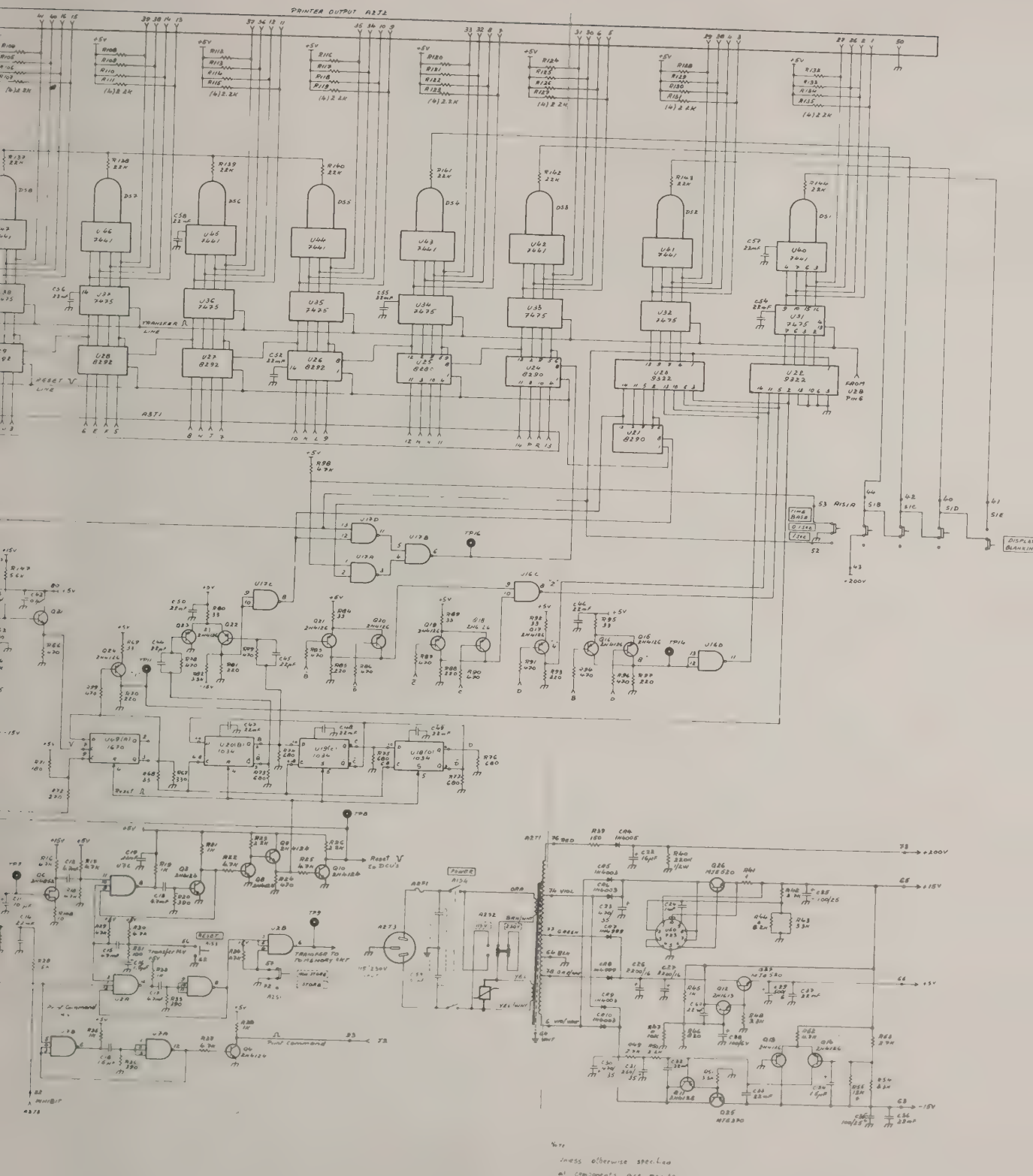


Figure 7-4. Schematic, Main Assembly A3

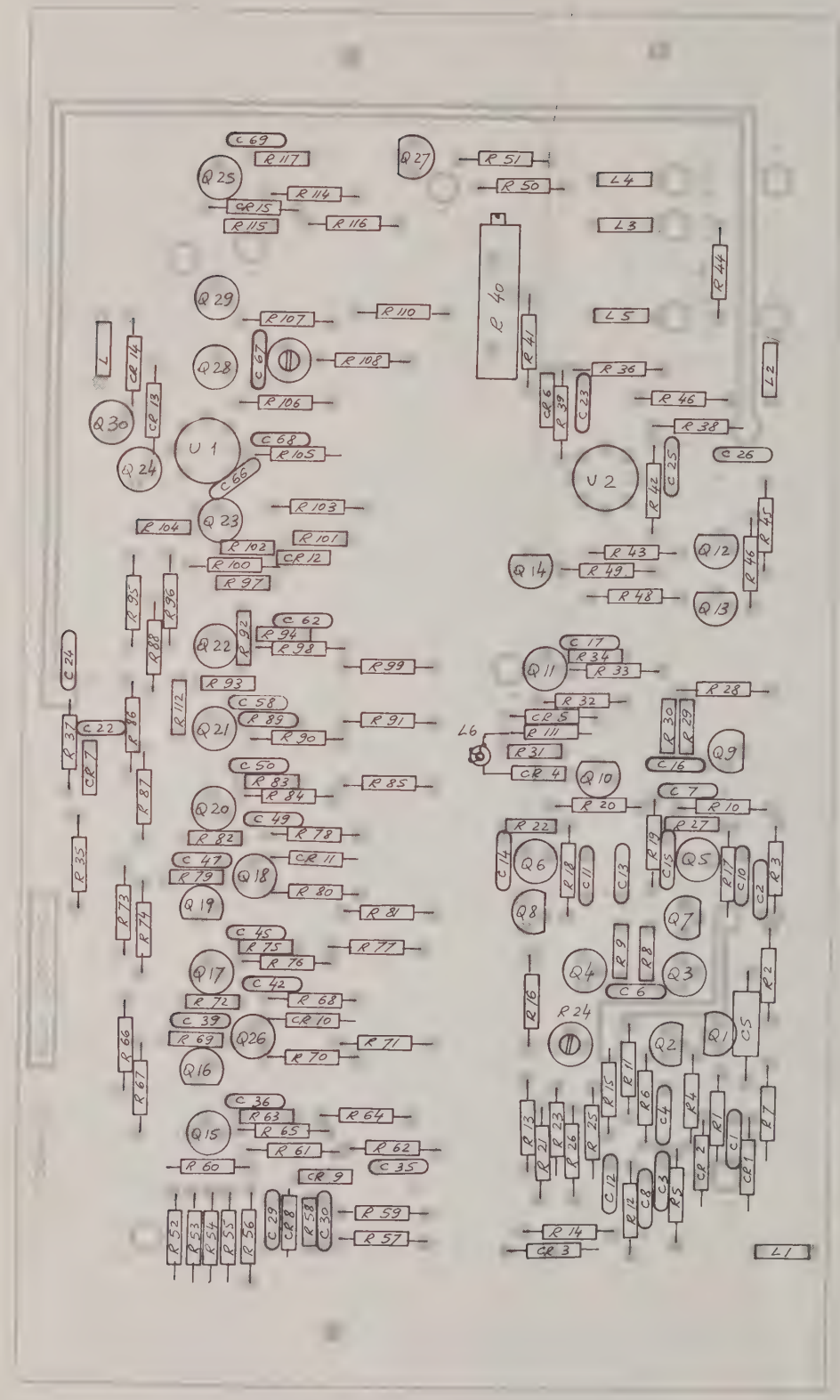
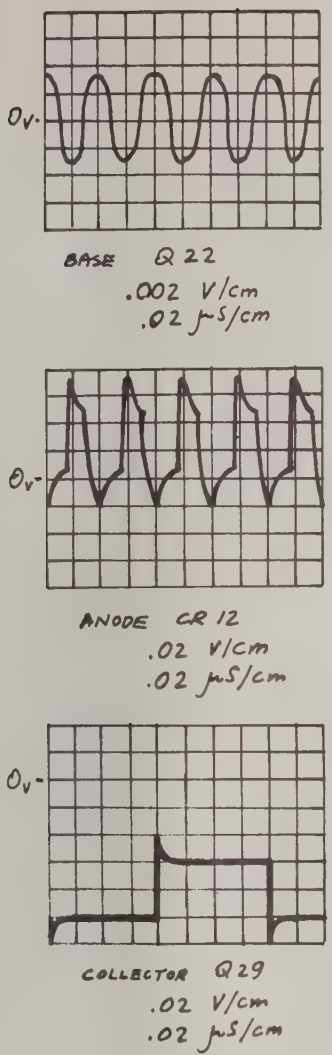


Figure 7-5. Component Locations, Input Circuits A4

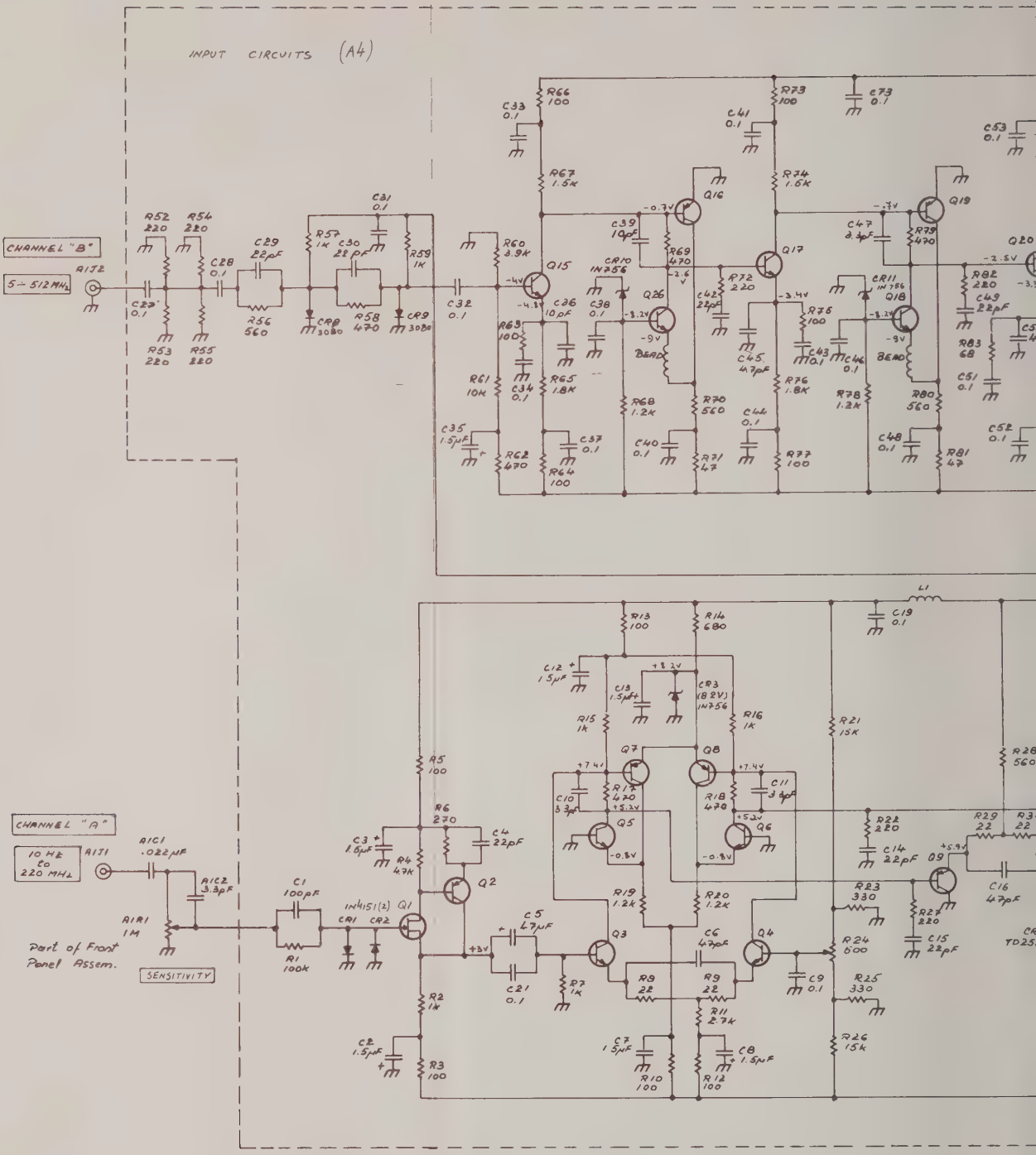


All waveforms dc coupled through 10:1 divider probe.

Input signal to Jack B:
Frequency – 20 MHz
Amplitude – 100 mV ptp.

Counter Controls:
Input – B
Time Base – 1 sec
Display Time – min

Figure 7-6. Test Point Waveforms, Input Circuits A4



NOTES :

2N5459	Q1
2N3640	Q2, Q7, Q8, Q9, Q10, Q16, Q19
2N5179	Q11, Q15, Q17, Q18, Q20, Q21, Q22, Q23, Q24, Q25, Q26, Q28, Q29, Q30
2N4124	Q12, Q13, Q27
2N4126	Q14
2N3646	Q3, Q4, Q5, Q6

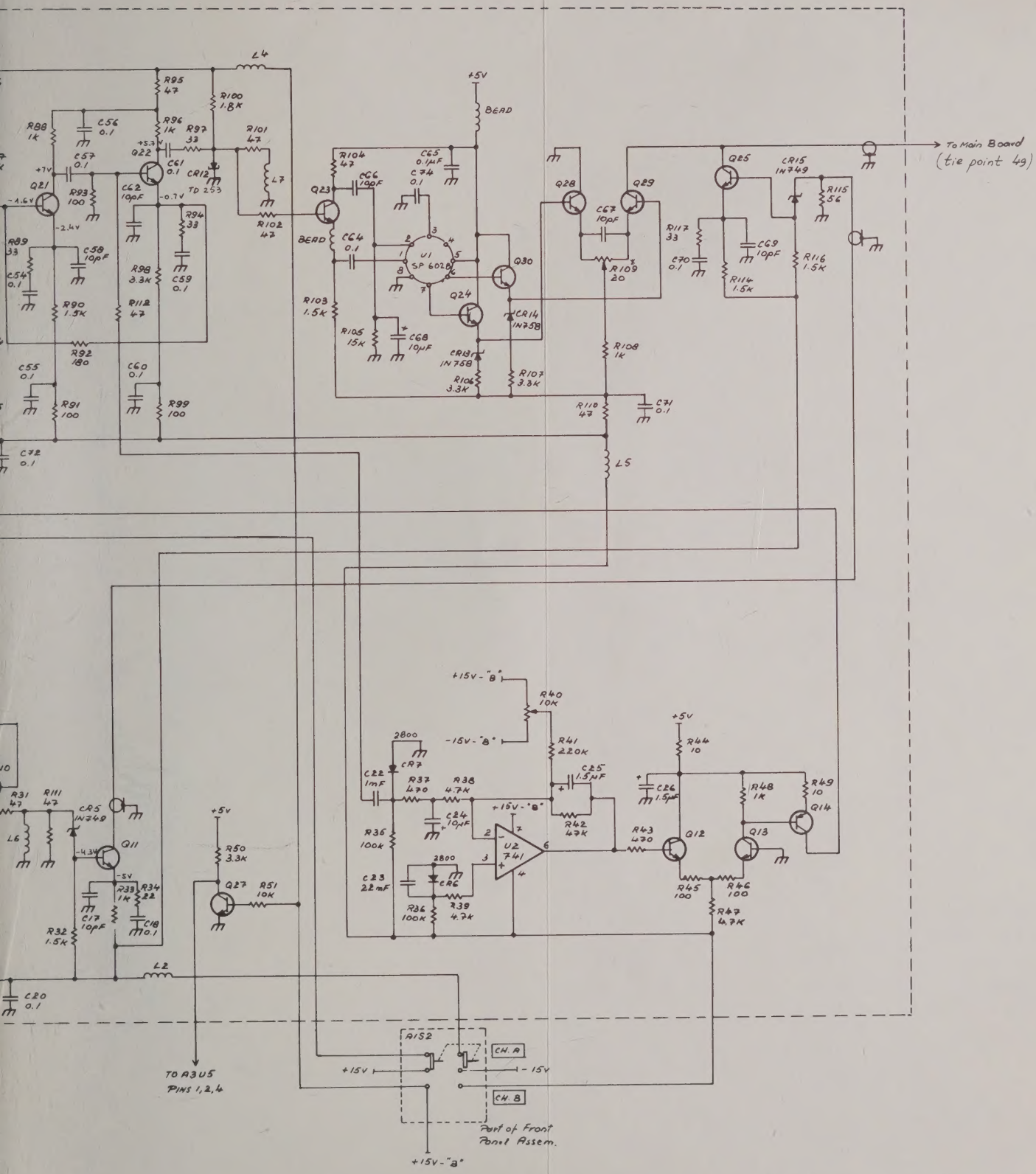


Figure 7-7. Schematic, Input Circuits A4

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